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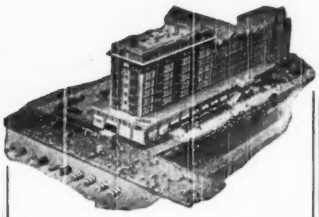

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School Gardening

Following the amalgamation of the National Garden Institute of World War II days as a division of Friends of the Land, a special school garden program has been undertaken. Paul R. Young, whose work as Supervisor of Gardening in the Cleveland schools has become nationally famous, will serve as school garden consultant and advisor. A "School Gardengram" has been issued in which Mr. Young outlines a school garden program. Copies of this are available to teachers on request to National Garden Institute, 1368, N. High St., Columbus 1, Ohio.

Leica Contest

Two thousand dollars in prizes is the lure offered in the 1950 Leica Sports and Action Competition. This contest is open to all Registered Owners of Leica cameras in the United States and possessions. Photographs may be in color or black and white, and the competition closes September 1, 1950. Full details from Contest Editor, *Leica Photography*, E. Leitz, Inc., 304 Hudson Street, New York 13, N. Y.

Seed Displays

There comes to hand from William D. Barkley, 728 E. 23rd St., Baltimore 18, Maryland, a clever and well-done seed display. An excellent 7½ by 9½-inch black and white picture of seeds is mounted on heavy cardboard. The picture shows the seeds greatly enlarged in a variety of interesting formations and markings. In the corner on the picture a little circle is cut into the mounting and, behind a little window of cellophane, are some actual seeds of the plant whose seeds are pictured. These are intended for a variety of display purposes. Further details are available from Mr. Barkley at the address given.

Another Stimpson

A Book about American History. By George Stimpson. New York. 1950. Harper and Brothers. 436 pages. $3.50.

George Stimpson is rapidly working up to a five-foot shelf of his "about" books, and this latest addition is as full of fascinating information and facts as the volumes that have gone before. As with its companion volumes, it is an interesting book to have around so that it can be picked up at odd moments for reading. An excellent index makes it valuable as a reference work. It is amazing to contemplate the surprising facts that the curious and indefatigable Mr. Stimpson has dredged up and about which he writes entertainingly.

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BRITISH RAILWAYS

Nature in Print

By HOWARD ZAHNISER

WE IN America who see the impingement of mechanization on our few remaining frontiers, and the many pressures for using even dedicated areas within our National Park system for commodity purposes, can well realize that the need for acting promptly to secure the preservation of whatever African wilderness is to remain, is as great as is the opportunity for such preservation in that continent still rich in primeval areas. Mary L. Jobe Akeley's *Congo Eden* is a welcome and inspiring account of the way in which this need and opportunity are being met in the Belgian Congo, and the volume is at the same time another tender and poignant testimonial to Mrs. Akeley's great husband, Carl Akeley, whose burial place is a shrine in the heart of one of the primeval sanctuaries that are to a great extent the results of his work. It is an outstandingly excellent book, one that will be valued by those who are interested in Africa, in wild animals, in the preservation of wild Nature, or in the journeys of the human soul.

In another outstandingly excellent — but, I fear, underappreciated — volume, published four years ago, an epic-like account called *Rumble of a Distant Drum*, which Mrs. Akeley wrote of her long retreat from the burial of her husband, we read of an old Boer farmer who came to the expedition's camp and apologized for the load of zebra hides he was carrying to market with the declaration: "Deeze zebra vermin only." The old farmer expostulated: "Never let zebra live. Zebra to crops very bad fellows. All farmers very glad when all zebra shot are." Mrs. Akeley reflected then that "the farmer-settler's common, perhaps inevitable, hatred of wildlife had been accountable for its practical elimination everywhere in South Africa, save in strictly preserved areas." In Equatorial Africa, she realized, "the fauna where unprotected would likewise be destroyed before the advance of agriculture."

Congo Eden helps us sense how great is the hope that is based on preserved areas and on protection for fauna and flora in Equatorial Africa. In Africa, as the guest of the Institute of Belgian Congo National Parks, Mrs. Akeley visited not only the great Albert National Park but also Kagera Park and Upemba Park, each of which she describes with satisfying thoroughness in terms of her own experiences, with the added information that such an intelligent traveler gathers from various sources. As the remarkably complete subtitle of the book announces, it is *A Comprehensive Portrayal of the Historical Background and Scientific Aspects of the Great Game Sanctuaries of the Belgian Congo with the Story of a Six Months Pilgrimage Throughout That Most Primitive Region in the Heart of the African Continent.*

This is a book of great interest in the primates. On her motor journey through that part of the jungle that has been penetrated by a highway, Mrs. Akeley, in telling of roadside motor troubles, describes monkeys challenging the human presence, and even a chimpanzee that "came right up to the roadside and from his treetop yelled at us, scolding loudly." In Albert Park an outstanding interest is in the gorillas, although there are certainly rival interests in the other wild animals and in the Pygmies.

"This entire region," Mrs. Akeley writes of Albert National Park, "consists of areas of unspoiled wilderness that have a rare and awe-inspiring beauty. It was here, in 1921, that Carl Akeley, while on his gorilla expedition, became so impressed with the unequalled grandeur and with the wealth for science which this primitive area possesses that he subsequently devoted many months of his full energies to its preservation. Today, as from time immemorial, the only dwellers of forest, plain, valley and mountain are the wild animals or primitive Pygmies. These denizens of the great solitudes have complete protection for all time under the wise laws of Belgium, initiated by the late King Albert. The sanctuary itself, named in his honor the Albert National Park," Mrs. Akeley writes, "is in fact a true laboratory of wildlife."

Congo Eden will have a continuing value and interest for its detailed account of the Pygmies, and of the life they live in these areas that for them are sanctuaries, too. The volume may similarly be said to have several other special values — for its chapters on elephants, on hippopotamuses, on the buffalo, on gorillas — chapters that combine the vividness of personal experiences with the comprehensiveness of encyclopedic articles; for its account of "Capturing Animals with the Camera;" its descriptions of the Belgian Congo mountains and their history of mountaineering; its intensely interesting accounts of the volcanoes and their exploration. Add to these special features a constant awareness of the flowers and other vegetation, and of the lakes and other features of the landscape, and the result is the unusually satisfying geographical contribution that *Congo Eden* is.

Ennobling all these accounts, all these descriptions, and, in fact, the very expedition of which *Congo Eden* is the record, is the pilgrimage that gives a human heart to the volume. "Here," writes Mrs. Akeley at the sacred goal of the pilgrimage, "on the crest of the Saddle, in the heart of the great wilderness, guarded only by the vast silences or the wildest storms, lay my husband's grave. The concrete slab with which we had covered it still bore plainly his name and the date of his last pilgrimage. Twenty years had passed since I had said farewell to this hallowed place — to hope and happiness and the deepest love and companionship a woman can ever know. At last I stood again where together we had reached 'the most beautiful spot on earth' — where suddenly he had journeyed on, but where for a while I must remain to accomplish the ends he sought."

Among these ends is the preservation of primeval sanctuaries, and of this preservation also Mrs. Akeley writes with persuasive eloquence.

"The Gorilla Sanctuary," she avows, "has been dearly bought by forethought, devotion and sacrifice. It has been maintained by intelligent effort and determined effort and skill. Let this, the richest of nature's gifts," she pleads, "the most promising laboratory of natural science, 'the most beautiful spot on earth,' be held inviolate."

Only in the Congo National Parks, says Mrs. Akeley, are there areas of primitive Africa where the primeval wilderness has not been destroyed and where "alien factors" have not been introduced. Here, however, in this "wilderness Eden," we do have what Mrs. Akeley describes as "an abundance and variety of fauna and avifauna probably unequaled elsewhere on the earth."

"Surely," she urges, "all men of intelligence and good will should not begrudge these few small fragments of our globe to those who seek for truth and for the facts of science which ultimately will enrich our knowledge of human life. They should cooperate freely and gladly and give their full moral support to this end. Then, too, they should be willing," she insists, "for our four-footed friends to continue to live unmolested in their immemorial homes."

On the concluding page of *Congo Eden* Mrs. Akeley earnestly says:

"I would that all those stirred by the beauty of wild creation might truly delve beneath the surface and touch the mysteries of this still strange and haunting land, and eventually come to share my enduring love of the Africa I know — the Africa of timeless magic, where, amid the solitudes he may experience a happiness and peace derived from his communion with the infinite and perhaps even attain a fragmentary vision and a dream of the boundless world before time began. For there, amid the solitudes, and there only, I believe, as my revered and honored friend, Marshal Smuts, has so aptly described it,

the human element sinks into utter insignificance and a subtle spirit, much older than the human spirit, grips you and subdues you and makes you one with itself.'"

But the climax of this remarkable book is more than a hundred pages earlier, in its record of the moments before the tomb of Carl Akeley when Mrs. Akeley and the Watusi guide, Mguru, who also had been on that fateful expedition twenty years earlier, paid "a final tribute" in a silence that was "broken only by some little happy bird singing in the blossoms overhead." Of these moments Mrs. Akeley wrote the words that for many readers will persist as the heart of her book:

"Surely," say these noble words, "long after this lonely white woman and the simple native are gathered to their fathers, this sanctuary in the uttermost wilderness will remain to mark the vision, the effort and the complete devotion of him whose life was given to the wilds he loved. . . . Throughout the years there will envelop and encircle this shrine the dear affection his friends and kindred bore for this single-hearted man. And forever will outflow the gratitude of countless others, many yet unborn who, cherishing the wilderness, will be enriched by this immortal legacy."

Congo Eden: A Comprehensive Portrayal of the Historical Background and Scientific Aspects of the Great Game Sanctuaries of the Belgian Congo with the Story of a Six Months Pilgrimage Throughout That Most Primitive Region in the Heart of the African Continent. By Mary L. Jobe Akeley. New York: Dodd, Mead & Co. 1950. 356 pp. (6 by 8½ in.) with a foreword by William King Gregory, 27 photographs on 15 plates, text map, and index. $5.

Work in Wildlife Field

Professional Opportunities in the Wildlife Field. By David B. Turner. Harrisburg, Pa. 1950. Stackpole and Heck. 208 pages. $2.50.

This is a new edition of this useful book originally brought out jointly by the Wildlife Management Institute and the American Nature Association, which organizations also jointly financed the study upon which the report was based. In order that the book might continue to be available, the present publishers agreed to bring out a new edition and take over the distribution of the book. An increase over the original price, which was much less than the cost of production, was necessary.

About Beavers

"Beaver Management and Ecology in Wyoming" is the title of a booklet written by James E. Grasse and Euvern F. Putnam and published as Bulletin No. 6 of the Wyoming Game and Fish Commission, Cheyenne, Wyoming. It is an extremely interesting, illustrated discussion of the beaver and its importance in a well-rounded ecological picture. Copies are available for twenty-five cents.

Adaptation and Origin

Adaptation and Origin in the Plant World. By Frederic E. Clements, Emmett V. Martin and Frances L. Long. Waltham, Mass. 1950. The Chronica Botanica Co. 332 pages. Illustrated. $6.00.

This is a monograph on the role of environment in plant evolution, presenting a wealth of unpublished data on experimental ecology and morphology, and prepared under the auspices of the Carnegie Institution of Washington, D. C. It is based on original researches into the nature of plant species and the results obtained through forty years of experiments in the climatic gardens on Pikes Peak and the gardens with controlled environments in Santa Barbara, California.

Garden Club Memories

Garden Club Memories and Experiences. By Lizzie Edmunds Boyd. Boston. 1950. Bruce Humphries. 86 pages. $1.00.

This little book is unique in that it is chiefly designed to preserve memories of garden club association through the years, apparently largely in relation to the James River Garden Club of Richmond, Virginia, to which these "fragments," as the author calls them, are dedicated.

History of Biology

A History of Biology. By Charles Singer. New York. 1950. Henry Schuman. 579 pages. Illustrated. $5.00.

This is a revised and up-to-date edition of an important work first published in 1931. The author is Professor Emeritus of the University of London and a leading exponent of the historical approach to the teaching of science.

A Physicist Muses

Reflections of a Physicist. By Percy Williams Bridgman. New York. 1950. The Philosophical Library. 392 pages. $5.00.

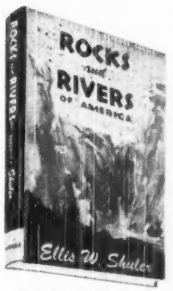
This is a collection of most of the non-technical writings of this noted Harvard physicist and winner of the Nobel Prize in Physics in 1946. The topics covered range over a wide field, finding unity in the fact that the "operational" approach is used throughout.

Oklahoma Conservation

Too late to be of much use to interested readers this year, comes announcement of the sessions to be held June 10 to August 5 at the Wildlife Conservation Station of Oklahoma Agricultural and Mechanical College at Greenleaf Lake, Braggs, Oklahoma. Those who might have been interested could get a copy of this year's announcement in anticipation of next year. Oklahoma A. and M. is at Stillwater.

Fernglen Workshop

Sessions of the Fernglen Workshop of Biology and Nature Study will be held again this year. Full details from Mabel E. Turner at State Teachers College, Lowell, Mass.



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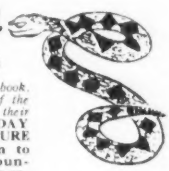

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Guarantee Mfg. Co., 2922 N. Pulaski Road, Chicago 41, Illinois, announces a game fish lure called "Smoothie" that is designed in such a way that it will resist all weeds and fend them from the hook. "Smoothie" costs a dollar and "Smoothie, Jr.," eighty-five cents. . . PDQ Products, Box 568, Canton, Ohio, is offering a liquid dressing that will make fly lines float for hours. Treating line and fly with it is simple. . . Picnic Hickory Products, Muscle Shoals, Alabama, is packaging "Chipped Picnic Hickory" that will, when a few handfuls are placed around the fire, produce billows of fragrant hickory smoke and penetrate meats being cooked. A three-pound carton sells for one dollar, postpaid. . . Johnson and Johnson is offering a new "First Aid Cut-Kit" packed in a transparent plastic box and specially designed for carrying with you in the outdoors. It is of a size to slip into pocket or handbag. . . The McKee Glass Co., Jeannette, Pa., offers, "as an aid to gracious living for song birds," a weather- and cat-proof wren house in any of four bright fired colors and made of glass. It does not need to be repainted and is cleaned and brightened by each rain, and a detachable metal bottom makes cleaning easy and a bracket makes hanging simple. . . Wherever there is water it may be made pure and safe at low cost, claims Paddock Sales of Texas, 3727 Atwell St., Dallas 9, Texas. They market a complete packaged water system" called Tri-Sure. . . San Lico, Inc., 846 State Street, San Diego, California, announces a new, popular-priced line of "Tigerglass" fishing rods ranging from fresh water casting rods to marlin rods. . . The George Schrade Knife Company of 46 Seymour St., Bridgeport 8, Conn., has produced a new knife that combines a complete eating unit with a fishing and general utility pocket knife. It is called "The Camper," sells for $3.50 and is a clever gadget. . . Sargent and Company of New Haven, Connecticut, is proud of the Bernard Gorilla-Grip Fisherman's Pliers that it is offering to fisherman for two dollars. . . Central Die Casting and Mfg., Co., 2935 West 47th Street, Chicago 32, Illinois, comes forward with a little, three-power field glass in an inexpensive carrying case for two dollars. The lenses are molded from crystal-clear plastic set in a lightweight die-cast metal body with adjustments. It is more than a plaything and from personal inspection we can report that it is a surprisingly efficient little instrument that, although no substitute for a fine field glass, can be a source of pleasure and use by vacationers, hikers and youngsters. . . Racine Specialty Mfg. Co., 1417 Hamilton Street, Racine, Wisconsin, offers a "Lawn Dinette" for outdoor dining. It is a pre-fabricated assembly with table and attached benches and comes in three sizes. It may be dismantled easily and stored during the winter. . . Neoxyn is the trade name that William H. Rorer, pharmaceutical chemists of Philadelphia, have given to their new treatment for poison ivy, a departure from old-time treatments for this dermatitis. They sent us a sample that we have not had an opportunity to try out, and we hope we will not. . . "Alert Alarm" is the name given by Electromagic Company, 1033 Penn Ave., Pittsburgh 22, Pa., to its inexpensive—$1.98—burglar and intruder alarm, which requires no wiring and, when installed over door or window, will sound a loud tocsin upon intrusion. . . DuMaurier Company, Elmira, New York, have announced clever little pocket microscopes of 20 power and 40 power, at $2.98 and $3.95 respectively, and a pocket telescope and microscope, which is a 6 power telescope and 20 power microscope in one, at $9.95. . . The Washburn Company, 1302 Preston St., Rockford, Illinois, produces three new special packs of outdoor cooking tools of stainless steel specially designed for convenient carrying. The same company has devised a portable picnic stove for charcoal briquet or hardwood cooking outdoors. It folds up compactly and weighs ten pounds.

Fisherman's Encyclopedia

The Fisherman's Encyclopedia. Edited by Ira N. Gabrielson and Francesca LaMonte. Harrisburg, Pa. 1950. Stackpole and Heck. 698 pages. Illustrated in Color and black and white. $12.50.

This is an imposing work and a remarkable achievement in piscatorial publishing. A long list of authorities and writers contributed articles within their special fields. An introductory chapter discusses fish biology and evolution. Then follows a large section on game fishes, both salt and fresh water; a section of fishing equipment and fishing methods; sections on fishing craft, fishery management, places to fish and when and how to fish. A final section treats with a variety of miscellaneous topics. This large book is profusely illustrated, and its numerous color plates of the various game fishes and of the various lures, flies and such will be valuable and a delight to fishermen. We cannot imagine that the editors have overlooked anything a follower of the immortal Walton would like to know.

Junior Encyclopedia

Oxford Junior Encyclopedia, Vol. II, Natural History. Edited by Laura E. Salt and Geoffrey Boumphrey. New York. 1950. Oxford University Press. 486 pages. Illustrated. $8.50.

The second volume in this set of books for young people is devoted to the field of Nature, generally treating with the plants and animals of the world. Obviously within the limits of a single volume it must be introductory, and the main concern of the volume is with the ways of life and behavior of the general and main groups treated.

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Adopted Kitten

From Elliott S. Barker, State Game Warden of New Mexico, comes the picture above. It shows one of three mountain lion kittens orphaned when one of the State lion hunters took an old female with three kittens. The hunter's dogs killed two of the kittens, but the third was turned over to the female dog owned by District Warden William Huey. The dog was raising a litter of pups, but took on the added task of raising the little cat without protest. Mr. Barker says that, in its lion control activities, effort is made to take the kittens, if there are any, alive, to raise them and turn them over to zoos.

Guide to Outdoors

The Outdoor Guide. By Luis M. Henderson. Harrisburg, Pa. 1950. Stackpole and Heck. 351 pages. Illustrated by the author. $4.50.

This is a guide and aid to self-sufficiency in the outdoors. It covers tracking and trailing, what to wear, housekeeping in the wilderness, canoeing and portaging, cooking outdoors, making camp and many other details calculated to make outdoor experiences enjoyable and well-rounded. Although intended to be informative and instructional, the text is entertainingly written and draws upon the author's long acquaintenance with wilderness and existence in it.

Rhododendrons

Rhododendrons. By F. Kingdon-Ward. New York. 1950. Pellegrini and Cudahy. 128 pages. Illustrated. $2.50.

This little book is written by a British rhododendron authority who has spent more than thirty years hunting plants in many far eastern countries and has come to know in their native homes many of the species he describes. Interest in these shrubs is currently high and this book should be valuable to all with an enthusiasm for them.

Contents Noted

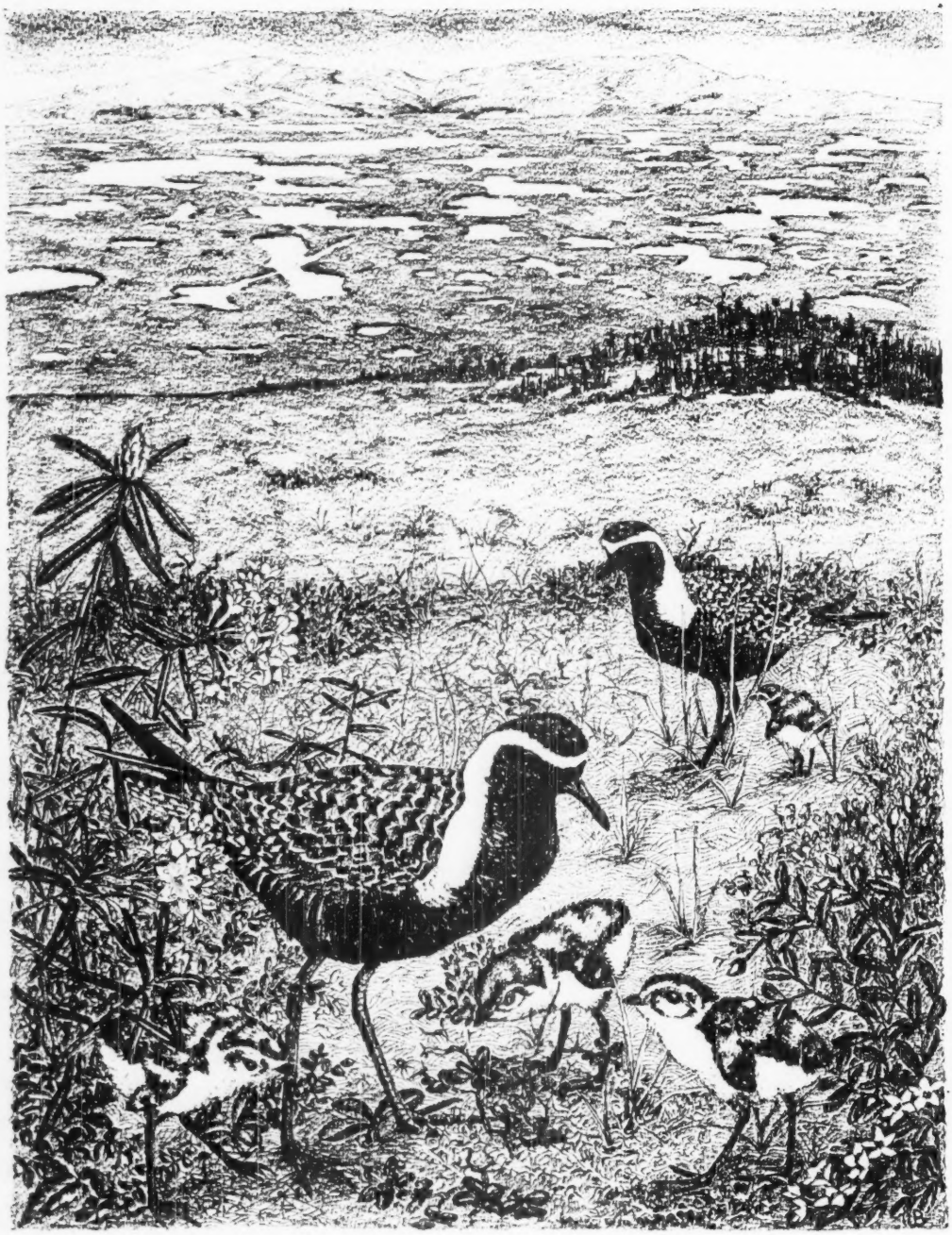
THREE House bills and one Senate bill have been introduced in Congress, all four with identical terms and a single objective — to reestablish the Civilian Conservation Corps of the early Thirties. The measures would provide opportunity for "useful public work in connection with the conservation and development of the natural and human resources of the United States through the employment of youthful citizens of the United States who are unemployed and in need of employment." The work would be on lands owned by the Government, or under its control, and dedicated to the conservation of natural resources, or on State lands similarly dedicated. The original Civilian Conservation Corps was hurriedly created in depression days to provide employment for many young men for whom no jobs seemed to exist. It was basically a social idea, use of the man-power in the forests, on the watersheds, in parks and elsewhere being selected as a logical and healthful way of expending this energy. No little of the early work of the Corps left a good deal to be desired; some of it even being destructive. This reflected the speed with which the Corps had to be set up and its enrollees put to work. Also a good deal of work done was later to be wasted for lack of manpower to maintain developments. A source of manpower, competently trained and led, working on well-planned and integrated programs, and presumably permanent, at least at a minimum figure that would guarantee maintenance, could be a boon to conservation. However, it would seem to us that before any such legislation is enacted into law a definite proof of the need should be drafted by those conservation agencies concerned.

SPECIALIST for the U. S. Fish and Wildlife Service in foreign game birds, Gardiner Bump has left for Iran, Syria, Turkey and adjacent countries. His goal is to seek out in the Near East desert-bred game birds that might find our semi-arid, over-grazed lands in the Southwest to be hospitable and liveable. The aim, of course, is to provide more hunting of game birds in that region. Dr. Bump has already journeyed to Scandinavia to bring back black grouse and large capercaillie. These avian immigrants are currently pioneering on Outer Island in Lake Superior. There is considerable doubt in some quarters — and we share that doubt — as to the wisdom of introducing exotic species. The Fish and Wildlife Service emphasizes, in a release announcing Dr. Bump's quest, "that any birds introduced must not be competitors with native species nor likely to become an economic liability." How it is possible to determine in advance that these displaced poultry will not afford such competition, or otherwise be a pain in the ornithological neck, escapes us. Australia and New Zealand offer sad examples of the ill-advised introduction of exotic species, and graphic evidence of how quickly they can get out of hand. Somehow it seems more logical to give our native forms the best break possible in point of habitat, and encouragement through courageous management, and let it go at that.

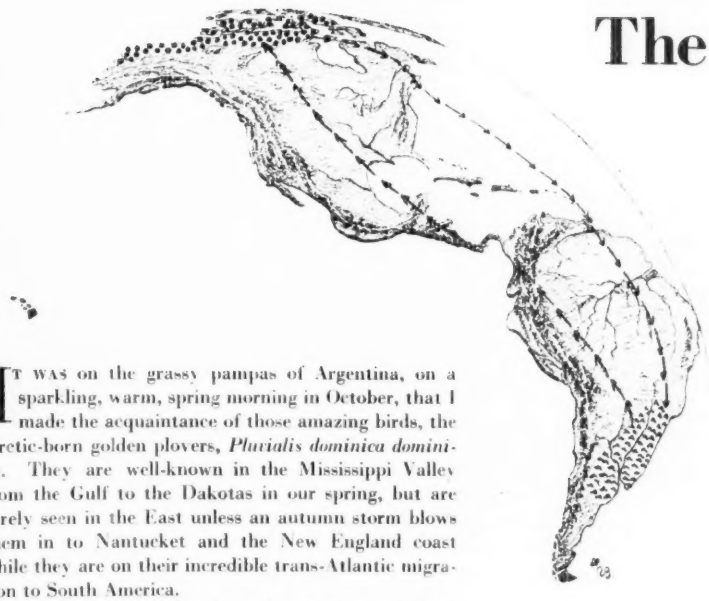
MARKED for invasion by the dam builders is the Rogue River of Oregon, fishing stream of noted caliber and still a river of beauty. Such is the threat that a Preserve the Rogue Association has been organized, with D. H. Barber of Trail, Oregon, as its president. Speaking at a public meeting on the menace to the Rogue, and citing the details and cost of the program, Mr. Barber says: "All this for one thousand new farms to raise pears that already are a burden on the taxpayer, or other crops to compete with other farms on a rapidly lowering farm market. Are we going to continue to be fools enough to pay too much to irrigate new land, and then pay out more for subsidies on the additional crops the land produces?" More and more people are asking that same question, not only on the banks of the Rogue but in many another river valley. We have asked the question ourselves, and have yet to get any satisfying answer, beyond the rather unconvincing assur ce that the present surpluses are just temporary. The other night we dug out our old economics textbook of our college days in the 'teens. It is a mighty interesting old book; and not so old, at that.

READING the more than sixty-thousand words submitted in the "Golden Rule for Wildlife" contest, and making a decision as to the prize winners proved a task too great for the judges to complete in time for announcement in this issue. Results and prize-winning comments will appear in August-September.

"THERE are certain values in our landscape that ought to be sustained against destruction or impairment; though their worth cannot be expressed in money terms, they are essential to our 'life, liberty, and the pursuit of happiness;' this nation of ours is not so rich that it can afford to lose them; it is still rich enough to afford to preserve them." With this observation Newton B. Drury, in his annual report as Director of the National Park Service, discusses various threats to the integrity of areas under his administration during the past year. Although not falling within the period covered by the report, the most recent of these threats is that to Dinosaur National Monument. In hearings on the proposals to build two dams within this Monument, the value of intangible, primeval beauty ran headlong into values provided by irrigation and power. Sitting in judgment on the opposed views of two agencies under his direction — Reclamation and Parks — Secretary of the Interior Chapman had to weight those values. He probably will have made up his mind before this appears in print. We have great fear that we are going to be disappointed in Mr. Chapman. R.W.W.



When the young are hatched in the middle of July they are covered with a soft grayish or buff-colored down. As soon as their coats are dry, a few hours after hatching, they begin scrambling about among the nearby and bounteous supply of mosquitoes, gnats, beetles, flies and juicy larvae, fending for themselves.



The Amazing Golden Plovers

By JOHN W. WHITE

Illustrated by Vera Boardman

The flight of the golden plovers from Canada to Argentina is one of the most remarkable of all bird migrations.

IT WAS on the grassy pampas of Argentina, on a sparkling, warm, spring morning in October, that I made the acquaintance of those amazing birds, the Arctic-born golden plovers, *Pluvialis dominica dominica*. They are well-known in the Mississippi Valley from the Gulf to the Dakotas in our spring, but are rarely seen in the East unless an autumn storm blows them in to Nantucket and the New England coast while they are on their incredible trans-Atlantic migration to South America.

When I saw my first plover I was sitting with an Argentine friend in the deep shade of an ombú tree, near a lagoon that was skirted by a sparse growth of rushes and pampas grass. Now and then I caught a glimpse of a long-legged, brownish bird running briskly about among the rushes. It was the most graceful bird I had ever seen. And so busy! It would run quickly for a few feet, stop suddenly, hold its head high, and look around. It would strike sharply at its feet and swallow the food it had found; then scurry off through another two or three feet of grass to repeat the performance.

My Argentine friend said the bird was a *chorlo*. It seemed to be alone. I had just made that observation when a clear, whistled alarm — *too-leet* — sounded in the rushes, over to the right. Instantly, about a hundred *chorlos* rose swiftly into the air from widely scattered points covering a couple of acres. They met in a compact group high overhead and flew away together.

These *chorlos*, as they are called in Spanish, bear little resemblance to the strikingly attractive birds one could have seen in Canada only a few months earlier. On the pampas their backs and wings are pale brown, mixed with greenish-yellow — colors that blend into the brown earth and dry pampas grass. The distinctive white shawl has disappeared from the head, neck and shoulders, which are now dull brown or grayish-white. The breast and abdomen are a mottled grayish-brown, instead of black. The plovers remain, however, the most graceful and attractive birds on the pampas.

My Argentine friend suggested that, since I seemed so interested in the birds, we might return to the lagoon at midday when, he said, they gather for their daily gossip. Sure enough, instead of separating widely as they had while feeding in the morning, there were more than a hundred of them in the lagoon, as gregarious as Rotarians, drinking, resting, and chattering among themselves in the most sociable manner. When the midday heat subsided in late afternoon, the birds scattered again over their feeding grounds.

The flight of the golden plovers from Canada to Argentina is one of the most remarkable of all bird migrations. It includes a 2400-mile non-stop flight over the ocean from Nova Scotia to Venezuela, and then a 1500-mile hop over the vast Amazonian jungles.

Some of these incredible birds go almost to Tierra del Fuego before turning northward again, thus covering 12,000 miles in the ten months they are away from their breeding grounds. Those that escape the countless hazards of their wanderings enjoy the most widely varied diet in the whole bird kingdom.

When the plovers arrive back in Canada, wearing their colorful nuptial plumage, they are the most beautiful of all the shore birds. About the size of small pigeons, they stand high and gracefully on their long wading legs. On the crown of their heads, there are streaks of golden brown, which seem to run over and trickle down the back of their necks. The feathers on their backs and upper-parts are tipped with gold, and glisten in the sunshine like the metal itself.

All these tiny golden jewels sparkle in a background of rich warm brown. Against this warmth is a sharp contrast of shiny black, on the throat, breast, and under-parts. Then, as though this were not enough for one small bird, there is a stripe of pure white across the forehead and extending back behind the eyes and

down the sides of the neck and breast. It looks like a tiny white shawl.

Shining out of this beautiful display of colors are a pair of large, lustrous brown eyes.

All this contrasting coloring makes the golden plover, of course, one of the most conspicuous of birds when it is running around on the gray reindeer moss of the Arctic tundra. When it needs to become inconspicuous, however, the plover has only to crouch low enough to conceal its black under-parts in the moss. Then the checkered back blends into the colors of the moss and lichens; the dark breast becomes merely a shadow; and the white stripe cuts the whole into two parts that look like anything on earth except a bird. When the plovers are nesting, it is almost impossible to see them, even when you know they are there.

These beautiful birds breed on the Barren Lands northwest of Hudson Bay, and along the Arctic Coast as far westward as the mouth of the Mackenzie River; and

The nest, with its four eggs, is just a slight depression in the moss or in the ground, often with solid ice only a foot below.

northward to Melville Island, the Melville Peninsula, and Wellington Channel. Most of them make their nests north of the Arctic Circle. The nest is just a slight depression in the moss or ground, often with solid ice only a foot below.

The female lays her four eggs in the middle of June. These are creamy white of buffy brown and spotted with brown and black blotches. The birds make no effort to hide their nests, but the protective coloring of the eggs makes it difficult to see them. It requires 27 or 28 days for the eggs to hatch, and during that time the adults alternate in sitting on the nest and searching for food.

When the young are hatched in the middle of July they are covered with a soft grayish or buff-colored down, mottled with black. When an intruder approaches, either animal or human, the birds instinctively lie still among the pebbles and moss and can hardly be seen.

Unlike most young birds, the baby plovers are not dependent on their parents for food. As soon as their coats are dry, a few hours after hatching, they begin scrambling about among the nearby and bounteous supply of mosquitoes, gnats, beetles, flies and juicy larvae.

The little fellows do depend on their parents for warmth, however, and whenever a cloud hides the sun for a moment they scurry for the warm shelter of the older birds.

The plovers nest in widely separated solitude, just as they feed on the South American pampas. The nesting areas are abandoned as soon as the young are hatched, and the birds, old and young, start working toward a common gathering point, feeding as they go.

Food is so plentiful that the young grow rapidly. In a month they are completely independent of their parents, and the adults suddenly lose all interest in them.

Then the older birds get restless. They soar high into the air; circle about; fly off some distance and then come back. Finally there comes a day when the adult birds take off for Labrador, leaving the young ones behind.

In Labrador there is a plentiful supply of tasty berries, expecially crowberries. After feasting on these for a few days, the plovers continue down the coast to Nova Scotia. There they change their diet again. They spend a fortnight on the tidal flats, fattening themselves for their long flight by gorging on mollusks, shrimps, and marine worms.

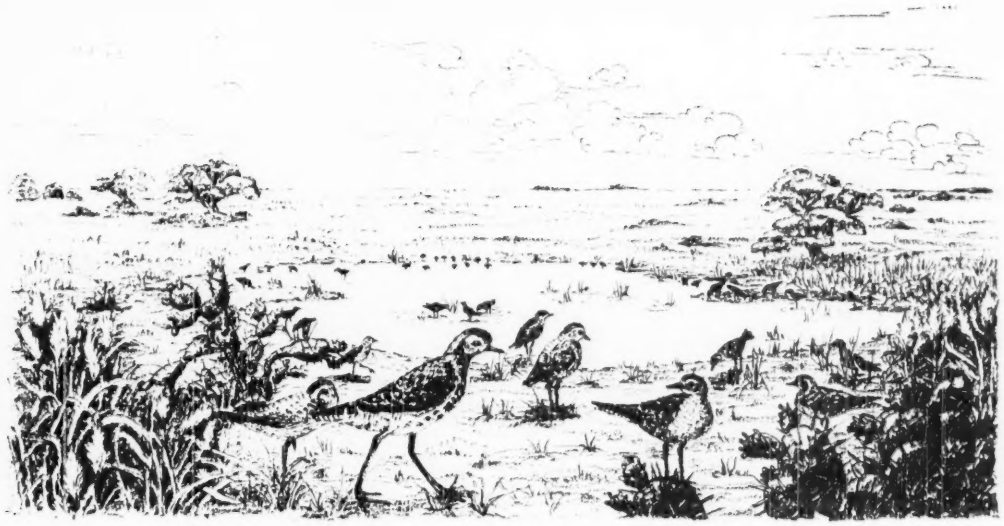
Before leaving Nova Scotia, the plovers spend many hours performing wonderful feats of flying, high over the marshes, as though strengthening their wings for their tremendous transoceanic flight southward.

Many of the North American birds that migrate to the South American continent fly overland and then take a short-cut across the Gulf of Mexico, flying only 600 or 700 miles over water. But not the golden plovers! They launch out boldly over the Atlantic, flying very high and in long lines similar to the V-formation of geese. They head straight southward to the northern coast of Venezuela, passing several hundred miles east of the New England coast.

If all goes well, they cover the 2400 miles in two days, flying at 50 miles an hour without rest. When they have a following wind they sometimes double that speed. The golden plovers fly faster than any of the other wading birds. Even among the ducks, only the hooded merganser is swifter.

Sometimes the plovers run into storms over the North Atlantic. Then they are blown westward to Nantucket Island and the coast of New England, where they alight and spend the time eating until the wind abates. Nantucket provides them with a feast of cranberries, crickets, and grass seed.

There is more good food in abundance as soon as they light on the llanos of Venezuela. Why the plovers do not terminate their migration on those hospitable



On the pampas of Argentina, where they are known as chorlos, the golden plovers bear little resemblance to the strikingly beautiful bird one could have seen in Canada a few months earlier.

plains is one of the many mysteries about them that has not been solved.

After a few days of rest and feeding, the birds set out on another non-stop flight of 1500 miles across the wide jungles of the Amazon to the food-laden savannahs of Paraguay. From there they work their way southward by easy stages to the Argentine pampas, where they were so enthusiastically admired by that great naturalist, William Henry Hudson.

Perhaps the most wonderful of all the feats performed by the golden plovers is the fact that the young birds leave the breeding grounds four or five weeks after the adults, and, without guides, follow the same route to the same destination.

Argentina has no protective laws against the slaughter of plovers, as do Canada and the United States, and the *chorlos* are eagerly coveted game birds. They arrive singly, in pairs, and small groups, over a period of several weeks. They are very lean after their long journey and so are not considered worth shooting. But food is abundant on the pampas and in a few weeks the birds are plump and highly appreciated by gourmets. Thousands of them are shot during the six months they remain on the pampas.

By February the plovers are ready to start their homeward migration, which is another amazing chapter in their life story. Somewhere in ages past they learned that Labrador, where food is so plentiful and tasty in the autumn months, has nothing to offer them in the spring. So they return home by way of the Pacific!

The homeward route through the interior of South America has not been traced with certainty. It appears, though, that the birds fly northwestward through Argentina, and then along the eastern side of the Andes until they reach the fertile valleys of eastern Peru. Somewhere in that region they rise to a height of about two miles to fly across the mountains and then continue on out over the Pacific to avoid the forests of Colombia.

These tremendous flights to avoid trees are forced upon the golden plovers because, like ostriches, they have been provided with cursorial feet, adapted to running and walking. Lacking the hind or prehensile toe, however, they cannot perch on boughs and limbs. So, while most of the world's birds eagerly seek the protection of trees, the golden plovers carefully avoid them and fly whatever distance is necessary to take them to wide, untimbered plains.

On the Arctic tundra, many plovers are born within sight of the trees along the timber-line, but never among them. Their migrations take them over incredible distances, sometimes over water, sometimes over trees, to mud-flats, llanos, pampas, savannahs and prairies.

Golden plovers have been seen on the dry plateaus of Guatemala, resting and feeding before crossing the Gulf of Mexico. Many ornithologists believe, however, that most of them make another non-stop flight of from 2000 to 2500 miles from eastern Peru to the treeless prairies of Texas.

They appear in great numbers in Texas and Louisiana in April and travel leisurely northward through the Mississippi Valley, feasting on the grubs, cutworms and wireworms of the newly plowed fields, as well as on grasshoppers, spiders, crickets and caterpillars.

The birds molt again on the northward migration, so that by the time they reach the Dakotas, at the end of April or early May, they are dressed anew in their exquisite nuptial plumage and are now truly beautiful.

The arrival of the golden plovers in Saskatchewan and Alberta is in sharp contrast with their almost imperceptible invasion of the pampas. On their northward migration, they appear suddenly. One day there are none; the next day there are hundreds of them, piping their melodious notes. They skim swiftly over the prairies, close to the ground, in close and ever-changing formations, appearing, like the swallows, to be flying for the sheer joy of it. They rise high into the air, whistling as they soar.

As soon as they cross into Canada, the plovers speed up their traveling, and are on their nesting grounds by early June. The ice and frost has not yet disappeared and the food supply is the poorest in all their annual cycle. Insects are scarce in the Arctic regions at this time, so the plovers have to be content for a while with frozen berries, left over from the previous year. Why, then do they return? Because they have been drawn home by an instinct that is more compelling than hunger.

The males fly high over the tundra in great circles, crying their musical *too-leet, too-leet,* thus claiming with song, as do so many birds, the territory they have chosen for their nests. It is at this time that they choose their mates. And then the whole story starts over again.

Thousands of the golden plovers have not come home. The wonder is, indeed, that so many manage to get back to breed a new generation. Many were killed by storms at sea. Many others were hypnotized by the white glare of lighthouses and lured to a crashing death against the lenses. Many succumbed to droughts on the Argentine pampas. Others were not able to make the long high flight across the Andes. Everywhere outside of the United States and Canada they were hunted constantly. And now, home again, the Arctic foxes are waiting along the timber-line and the duck hawks along the shores of Hudson Bay.

At the turn of this century these beautiful golden plovers were following the passenger pigeons and the Eskimo curlews into oblivion. The American and Canadian governments put strict conservation laws into force just in time to save them from extinction.

The golden plovers are not prolific. They are of inestimable benefit to farmers in both the northern and southern hemispheres because they destroy great quantities of grubs, cutworms, wireworms, locusts, grasshoppers, beetles, and other destructive insect life.

In these uncertain times perhaps it is too much to expect nations to concern themselves with international agreements to prevent the shooting of migrating birds while they are on their winter feeding grounds. But, at least, the protective laws of the United States and Canada have made it possible for the beautiful golden plovers to fly again.

So far we have considered only the golden plovers of eastern North America, and it is desirable to refer briefly to the race breeding in northwestern Alaska and Siberia, for its feats of migration are fully as daring as those of the eastern race. This western race winters in India, China, Japan, and the larger islands of Oceania south to New Zealand and Tasmania, and in the Hawaiian group. To reach the more remote of these islands the Alaskan birds make long flights over the open ocean in both their autumn and spring journeys, except for an occasional opportunity for a bird to alight on the open ocean to rest, and then resume its flight. Solitary birds have been observed to resort to this method of resting, but in view of the small number of islands existing on the great stretches covered, it appears that continuous flights must be maintained by most of the birds for at least 2000 miles, without rest or food. In keeping to the right course, it is supposed that the birds must be guided largely by the direction of the prevailing winds. Considering that the young birds of the year must make the autumn journey without guidance or previous experience, the successful accomplishment of such a journey may well challenge our admiration.

★

Portrait by Audubon

By ELEANOR THAYER

Wild bird, perched quietly upon a limb,
Wings folded passively, toes calmly curled —
Tell me, wild bird, what did you think of him?

Eyewitness to your dark and pathless world,
What was he —? Wizard, Dauphin prince, or saint
That you posed willingly, with terror furled?

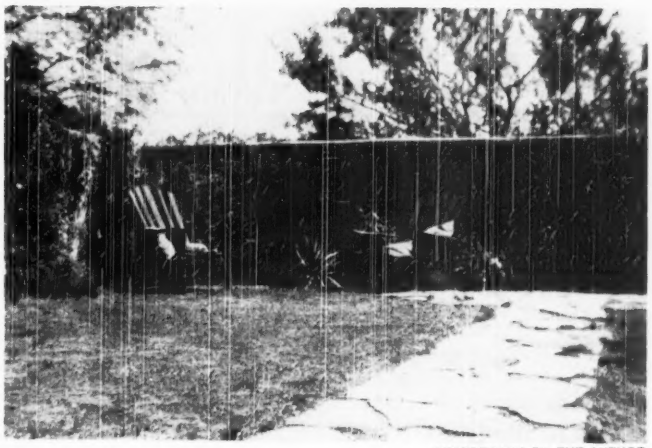
If in those overtures, melodic, faint,
He spoke the wild-bird language that you knew
Why was your answer merely soft complaint?

Since not one single feather lies askew,
Surely you preened above the river's brim
For each deliberate profile that he drew

Wild bird, what was this gentle interim?
Hypnosis? God? or just an idle whim

Peep in the Patio

By GEST VERY



A corner in the patio, showing the catclaw tree from which the cactus wren swooped down to do violence to the horned toad.

PHOTOGRAPH BY THE AUTHOR

LIKE many homes in Tucson, Arizona, ours has a patio, or outdoor living room. This is merely a walled garden where we may sit in seclusion among the flowers, enjoying the ever-changing colors of the mountains that tower above us. Equally fascinating is the drama of life enacted at our feet.

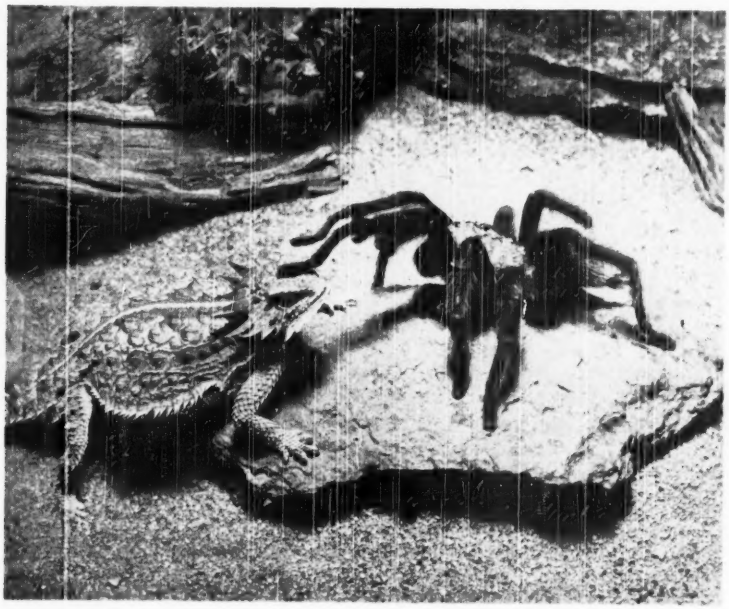
In places where the patio grass is scrawny, we notice several little holes, an inch or two across and almost perfectly round. Some of these start down straight as a pipe, others bend almost immediately out of sight. Just below the surface, each one is bridged by a twig or leaf, reinforced by cobwebbing — not the cartwheel type, but just a slight throw-over of silk to discourage the curious without hindering the owner's emergence.

Such emergence may cause minor panic in the patio, for, sooner or later, a large brown tarantula will step forth from one of the holes. This magnificently terrifying spider walks slowly, holding its body high on its legs, like a brown mouse on stilts. Both sections of its body, and all its legs, are covered with fur of bright tobacco hue, long enough in most places to be ruffled with a match stick.

Looked at head-on, this almost harmless creature has an expression of innocence, perhaps due to a pair of armlets that hang down, side by side, at the mouth and suggest a rabbit's split lip. These end in curved points, used both as hypodermic needles filled with poison and as machetes for digging in our tight adobe clay. All the extra earth is brought up by the mouth and deposited in slipshod piles not far from the hole.

Most of the tarantula's daytime hours are spent just beneath the top of the entrance. If I step close enough to peer down, I often see a flash of eyes, and a quick motion of disappearance.

When a tarantula out in the open takes up battle posture, it is a formidable spectacle, standing upright on hind legs, waiting to pounce. I have observed one holding this position



Among the dwellers in the patio were tarantulas and horned toads, the former fearsome in appearance but relatively harmless, the latter valued scavengers in keeping the ant nuisance in check.

PHOTOGRAPH BY MARVIN H. FROST

for many minutes, without a discernible adversary anywhere around. Perhaps it was only practicing!

There is a gigantic, inky-black wasp with orange wings that swoops into the patio looking for provender for her young. This "tarantula hawk" hopes to paralyze my tarantula, and to carry it away to serve as fresh meat for her larvae, until such time as they themselves shall fly forth seeking new tarantulas to nourish new wasps.

I watched one of these winged ladies at work. Repeatedly she flew to the hole, then withdrew to approach from new angles. All the while she vibrated her wings with tantalizing insistence. Suddenly from the dark depths, the tarantula shot up into the air in spectacular leap. It missed, but for the time being there was no more buzzing in the patio.

To coax one of these giant spiders out, my favorite method is to let a slow stream of water trickle from the garden hose into the hole, producing a gentle flood. The monster calmly climbs out to dry off in the sunshine. This does not always succeed, and sometimes the spider takes a notion to come only to the entrance. There it arranges its broad, overlapping legs across the opening, like the veins of a closed venetian blind, preventing even a drop of water from seeping through.

Although tarantulas do most of their prowling at night, fear has never deterred me from setting up an army cot beside the holes on a summer night and sleeping out under the magic of the stars. Yet, indoors, one night, I was scared as a fool when I snapped on the light and beheld one of the tribe on the floor, standing as still as a doorstop. It took all my nerve to whack it, and I quite understood the emotions of a neighbor, who, in similar circumstances, ran for a rifle and shot the beast to smithereens!

Among our more popular pets in the patio are the "horned toads," roundish lizards with vague designs on their peaked backs, collars of stiff points around their necks like Elizabethan ruffs, and hands as slender as any queen's. Their winkable black eyes look out sidewise, so that what one eye does not see, the other must.

In hot weather, no matter what the books may say about other horned toads, ours do not like the sun. They run under our garden chairs, each to his own particular spot where he has scuffed a little depression to lie in. There, in cool content, he passes hour upon hour without stirring, seeming to have no interest in the present, but a vivid recollection of some prehistoric ancestor, whose attitudes and patterns he imitates with decorative perfection. Should you disturb such a reverie by picking him up, he will probably do one of three things — swallow rapidly with slight noises, wriggle his head violently in vain effort to tear your hand to shreds with his jagged ruff, or jerk himself over on his back and play dead.

Which recalls the sad tale of two horned toads, captured before I had learned the habits of these strange lizards. I placed the pretty pair in a box, with a little sand to burrow in, and plenty of ants to eat. About three hours later I went out to admire them; there they were, lying side by each, the stubby little arm of one across the neck of the other, and both of them as dead as dead could be! With no chance of escape, they had been ready prey for the ants, clever enough to get under their ruffs and sting them to death.

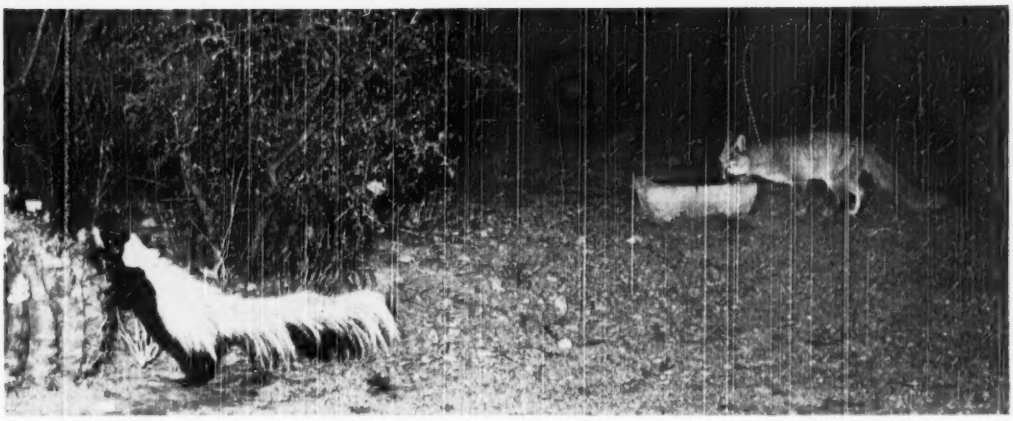
It was the vicious sting of another variety of ant, one that likes to get in open-toed shoes, that led me to put several horned toads at large in the patio. There were fourteen in all, varying in dimensions from cunning infants the size of small peach stones, to old granddaddies weighing up to two and one-half ounces. Their colors likewise differed, but all were more or less of a protective dusty pink. On the rough backs of all were intricate markings suggesting a broad, dead leaf with its central vein going from the head straight down to the tip of the funny little tail. Here and there was an irregular blotch of dark bluish-gray. So perfect was this camouflage that at times it was impossible to distinguish toad from half-shadowed leaf and clump of earth.

These toads did their work faithfully and well. I saw one of them lying with his chin toward an ant hill from which a river of ants was issuing. Stealthily he raised himself on stiff arms and lapped up forty-eight in rapid succession. After a few days we had no more trouble in the patio on that score.

When chilly weather came, most of the toads mysteriously disappeared, but two were still around even after

PHOTOGRAPH BY THE AUTHOR

Hole of leaf-cutting ants, showing the pathway of petals of the rose bush that lead to the entrance to the ant's home. About the entrance are petals and leaves waiting to be carried down below, where they would grow the mould on which the ants would feast.



PHOTOGRAPH BY MARVIN H. FROST

One moonlit night a cat-sized animal came over the patio wall. The author put out a hand to grasp the fluffy tail, but its white stripes fortunately deterred her as the animal disappeared under the house.

the temperature had gone below freezing. Feeling that they should be reminded, I piled a trowelful of earth on the back of one of them. He quickly crawled out. I tried dead leaves, with the same indignant response. As the days grew colder, he became alarmingly listless. Then one morning when I found him his eyes had been stolen, and it was certain that he had gone to rest for keeps.

The other toad needed no reminding. One afternoon he scurried over to a position where no one would step on him, and, without further ritual, began a furious digging. For this he was well provided, because toads have one extra-long "shovel" toe on their back feet; they use also their ruffs for whipping up the soil. He slithered and pushed with his head, and dug and kicked with his back legs, until he had finally wedged his body beneath a blanket of earth about four inches thick. Curiously he left one foot exposed. Could he be testing the temperature, so as to know whether he should go deeper?

The next day, at noon, we saw him again, lying on the warm flagstone path in the sun. Assuming he would go back when the sun lowered, I arranged a farewell celebration while the sun was still high. Just under his nose I placed a sprinkle of sugar and a bit of raw bacon. Unhappily, not a single sugar ant came to the feast, but when the bacon softened on the warm stone, a few grease-eating scouts came snuffing around. Old grandpa paid not the least attention to any of them. When the chill of evening came, he scuttled back to the very same spot as the night before and plunged head first under the blankets. For three or four days it was the same routine; sunbath in the heat of the day, sleeping bag at dusk. The sunbaths grew shorter, the sleeps longer. Then, one day, he did not get up at all; the ceremony of going into hibernation was over. Come wind, come rain, and they certainly came, there he dozed the winter through.

One April morning, when the thermometer said 85 degrees in the shade, the curiosity of my trowel could not be curbed, and it disinterred my friend, a rigid, eye-shut object that, with apologies, I hastily replaced. Later that same day he waddled forth of his own free will, sluggish of gait and dull in color. After a bake on the stones, he brightened mentally and the pattern on his back became more pronounced. At dusk, back to bed again. It was the exact reverse of the November schedule; now he stayed up longer each day, until at last he was up for good and all.

The final demise of this hardy lizard was tragic. In an overhanging bough of a catclaw acacia growing outside the wall, a pair of cactus wrens had built their twin nests. One of the birds spied the toad and, claiming squatter's rights, flew down with raucous chirps to complain. The astonished toad ran as fast as his legs would carry him, the noisy wren after him. The toad had only one defense. Standing stock still, sidewise to the bird, he lowered one edge of his spiny back so as to keep the beak from his soft under parts, at the same time tipping up the other edge as high as his little crocodile legs would allow. He seemed to reason that by displaying to advantage his fearsome armor he might intimidate the enemy. Often he had tried the same trick on me, when he did not choose to be picked up. But a cactus wren is no coward, and with hoarse croaks of delight the attack was continued. I rushed out too late; the toad lay bleeding on the grass with a hole in his throat.

Hearing another bird fracas one day, I arrived in time to see a bluish bird collide on wing with a cardinal. There were anguished shrieks; both birds dropped, and I saw the bluish one plunge its beak into the cardinal's heart. It was all over in a split second. The assassin flew off with its victim, and a hundred yards off in the desert I later found a pile of red feathers.

My attention had been so poignantly upon the poor cardinal that I was unable to identify the victor positively as a butcher bird. My impressions were that it

was of the same size as the cardinal and of an all-over slate-blue color. Before one passes sentence for the crime, there is one extenuating circumstance to be considered. We had had a prolonged drought, so that the abundance of seeds and verdure was almost totally lacking, with attendant scarcity of insects, small rodents and such, upon which the carnivorous birds depended.

Not in the least concerned with the drought, however, were the leaf-cutting ants, who put in their unwelcome appearance in the patio every two or three weeks for a brief visit. Sometimes they came at night, sometimes in the day; there was never a warning, and they arrived by the thousands. In an endless column they slipped under the gate, and, ignoring all other plants, made straight for one of three — a young honeysuckle vine, a young orange tree, or a group of red roses. When, in the course of time, the vine and the tree grew tougher, they attacked only the roses. Brazenly they would climb up and cut the petals and leaves into segments about a half-inch long. Many a time I have heard the sickening sound of their chop-chopping jaws at work while a persistent shower of colorful segments dotted the bare earth beneath. Within a few hours the assault was finished; they departed in perfect order, carrying off all the segments and leaving the naked bush a sorry skeleton of its former beauty.

Holding the segments high over their heads, they were like a long line of lateen-rigged boats with painted sails, heading for home. The sails were clumsy and they dropped many, making it a simple matter for me to locate their nest. When they reached the entrance hole to this vast subterranean city, they would surround it with a conspicuous wreath in temporary storage until congestion should clear in the tunnel and all the loot could be carried down in systematic fashion.

To exterminate these destructive pests, either by exploding carbon disulphide in their deep nest, or by applying considerable quantities of deadly poison in its various openings, was out of the question because of the proximity of our drilled well. They had to be permitted to live! The only solution, therefore, was to find some way to persuade them to give up the patio, about fifty feet east of the nest, and take their leaves from mesquites and other desert trees to the west. After trial, error and despair, I at last found the way.

Upon each new visitation, I put a token of poison in the hole, not enough to contaminate our water supply, and sprinkled a little also on the beginning of the path they had followed toward the patio. For about a week there would be no sign of ants; they would abandon the poisoned hole and stay under ground. Then they would open up a new hole, *a few inches further to the west.* They were learning that, toward the patio, they would encounter danger, whereas further to the west they could construct a new entrance with impunity. Still the marauding continued, and with infinite patience I had to repeat the lessons. Inch by inch, over a period of many wearisome months and with many a heartbreaking setback, I drove them to locate the entrance to the nest a full twenty feet farther to the west, so that they forgot the patio entirely, and regularly climbed the desert trees instead. How it delighted me to watch them chop-chopping to their hearts' content on the good-natured, indestructible mesquites!

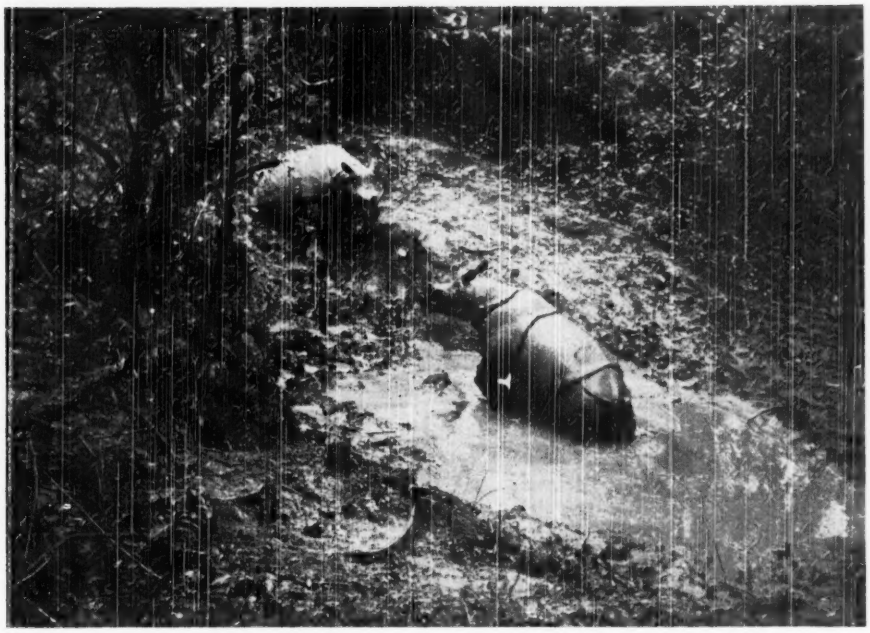
But, without thinking it through, I performed on my trained ants an unfortunate experiment. Knowing that they took these billions of leaves, not to eat a crumb of them but to cultivate upon them a fungus for their sustenance, I wanted to see if they would accept a mold of my own manufacture. I placed a few rose leaves in a jar, moistened and covered them. As soon as the white film appeared, I laid the infected leaves at the mouth of the nest, and was happy to see in what short order they hurried them down. One might almost have thought them capable of gratitude. But the little villains, with the long-deprived savour of rose-mold on their lips, stole to the patio that very night and once more laid bare the thorny limbs of the rose bushes. Their teacher had to commence again!

Even more reprehensible than the inconsiderate leaf-cutter, is an ant that comes to the patio from time to time with still more wicked intent. He sneaks in, I firmly suspect, with malice aforethought to plant cotton-cushiony scale on the orange tree. At least I never have found that scale without at the same time discovering the tell-tale procession of ants running up and down the tree.

Planning to outwit these miscreants once and for all, I painted a stripe of tanglefoot around the bole of the tree. At first there was heartening chaos — ants rushing down as far as the stripe, ants rushing up as far as the stripe, and not an ant getting across. Then one uncannily bright individual came up with something in its arms, and, standing on hind legs, tossed it into the sticky sea. The little ball of earth, no bigger than a pin head, rested where it landed, exactly at the edge of the stripe. My wrath gave way to fascination, as ant after ant came up the trunk with similar contribution. Running out to the end of the growing causeway, each one dropped the adobe brick, and before long the causeway was completed, and the ecstatic promenade was resumed as if nothing had interrupted it. Well, you can fool some of the people some of the time, maybe, but you cannot ever fool an ant!

During this episode I noticed on an orange leaf one of those ugly beings that resemble a squeeze of toothpaste and tar, but which bear the dignified name of "dog-faced caterpillars." Truly this one was no sissy. When I teased him, two ferocious, golden, jack-in-the-box horns popped out of his forehead, along with a faintly suffocating odor. Poison gas, and the war of nerves? I invited this hostile dog and his leaf into a jar, for which hospitality I was amply rewarded by finding there one day a great, black and golden butterfly weakly trying to flap its wings. For several days after being set free, it fluttered back to enjoy the jasmine vines on the patio wall.

Then there was our famous (Continued on page 332)



Two male Javanese, one-horned rhinoceroses disport in a typical wallow in the Reserve in the western part of the island.

Java's One-Horned Rhino

By ANTON DE VOS & A. HOOGERWERF

Photographs by A. Hoogerwerf

ONE of the most imposing looking animals of the world is now on its way to extinction. Except for a few ardent Nature enthusiasts, nobody seems to care. If measures are not taken in the very near future, a few mounted specimens of the queer Javanese rhinoceros will share space with other animals in some museums with the label "Recently Extinct." What will not be mentioned — but should be — is: "Through Human Carelessness."

It is unfortunately the bitter truth that the extirpation of this rhinoceros will be the result of the greediness of few and the indifference of others. To the misfortune of this pachyderm, a belief — dating back for a great many centuries — exists among some Oriental people that their horns, skin, certain other parts of their body, and their blood have magical medicinal qualities. Pulverized horn or skin are believed to cure almost any kind of disease, and to be able to restore lost strength, youth, and vitality. Cups made of the horn are believed to render poison innocuous. This creates a large demand for the rhinoceros and it has been, therefore, ardently hunted. That the animal is worth the hunters' while is shown by the fact that the horn alone is worth its weight in silver. One horn means one dead animal.

During the Dutch rule in Java, the rhinocerosses were adequately protected in a refuge on the extreme western point of this island. Now, on account of the chaotic-political situation in Java, not much attention is paid to the survival of the animals, which may result in an untimely extinction of the species.

Formerly the range of the one-horned rhinoceros included Bengal, Assam, Burma, Siam, Indo-China, Malaya, Sumatra, and west and central Java. It is now very likely that it has become restricted to western Java only, although it might still survive on Sumatra. This rhino disappeared from the mainland, and the greater part of Java, during the last few decades as a result of persecution by native hunters. However, some white hunters are also guilty. On Sumatra, thirty years ago, possibly a dozen of these colossuses still survived, yet a single big-game hunter since shot seven specimens within a few years' time.

On Java the species had reached a low ebb around 1930, when only twenty individuals were believed to have survived. As a result of strict police protection in the Oedjong Koelon Reserve in western Java the rhi-

A view of a river in the Oedjong Koelon Reserve in Java, where the rhino and other wildlife were protected during Dutch rule. The jungle background is mostly second growth.

noceroses increased remarkably well and probably numbered around thirty just before World War II. Apparently during the hostilities with Japan very few were poached, as natives were not allowed to carry firearms and there was fear of the few tigers that inhabit the reserve. Actually, the tiger may prove to be the best guardian of the rhino in the near future. Nevertheless a few rhinos may have been poached since the end of the war, as many Indonesians and Chinese are in the possession of firearms. Illegal killing, combined with the lack of interest shown by the authorities under the present chaotic circumstances, makes the future look far from bright for the Javanese rhino.

Rather little is known about this vanishing creature. It is secretive in habits and therefore difficult to observe. It is nearly always roaming around alone.

The Javan one-horned rhino differs from the Indian species by virtue of its smaller size, smaller horn, and a different pattern of the deep skin-folds. The thick skin is subdivided into small, scale-like discs, which make this pachyderm look like a prehistoric monster. It infrequently attacks human beings. As the rhino's vision is poor, attacks do not take place on sight, but on scent. As soon as a rhino has had a good smell of human odor, it either flees or charges. The speed such a heavy colossus can develop during a charge is really remarkable, and a person has to be a good runner and an agile tree-climber to escape. In the interests of survival, most of the observer's time while studying the rhinos was spent in trees. Nevertheless, he was attacked several times, and once his luggage was badly banged up during such an attack.

The vegetation of Oedjong Koelon, the game reserve where studies of the rhino were made and which covers an area of about 65,000 acres, consists mainly of second-growth jungle. The area is partially covered by a savannah landscape dotted with palm trees and, partially, by bamboo thickets.

The rhinos move through the reserve more or less in a criss-cross fashion, although tunnels are made in the vegetation in places that are often frequented. During their travels, the animals browse on the leaves and twigs of different trees and shrubs, and greases also are eaten. The

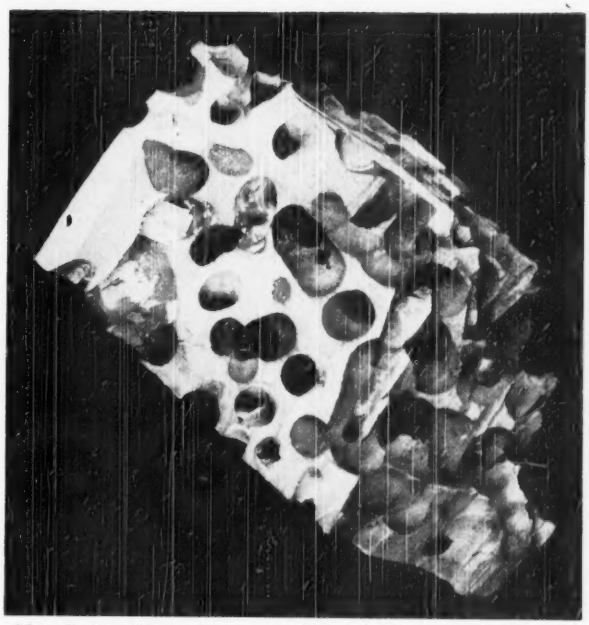
(Continued on page 332)

Side view of a male rhino in its wallow. Here the typical lone horn and skin folds of the pachyderm are visible.

Sea-Goin' Borers

By E. JOHN LONG

Official Department of Defense Photographs



Not Swiss cheese but a section of piling from Sweeper Cove, Adak, Alaska, in which shipworms had been operating. This section was below the water and in one foot of sand. The Adak base is of World War II origin and an important outpost in our defense program.

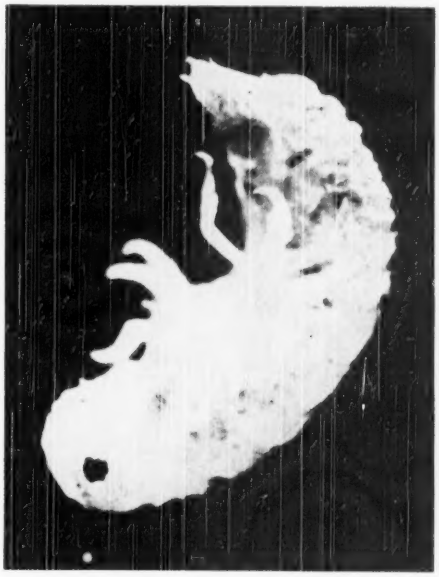
THE lowly shipworm and his nefarious pals of the marine-borers' family have played an important but underhand role in world history ever since man has gone down to the sea in ships. In fact, they have sunk more ships and caused more waterfront damage than all the other enemies of mariners combined, including fellow mariners! The Phoenicians complained about these tiny marauders; so did the Romans. So did Columbus and Sir Francis Drake.

"Well, why worry about it now?" you are likely to ask. "Don't modern naval ships, and even merchant vessels, have steel bottoms? The shipworm and his ilk should soon be as dead as the Dodo."

Which would be just fine if shipworms would stick to a strictly ship diet. But they will not and do not. Marine borers take their wood where they find it, and as often as not it will be a fine new pier, or jetty, or bulkhead, or spar buoy, or even a railroad trestle or bridge.

The United States Navy has all these structures on its books, in addition to several thousand small wooden boats and barges. So costly have become the replacements for shipworm depredations, especially in some of our new outlying bases in the Pacific, that the Office of Naval Research and the Bureau of Yards and Docks finally decided that, if no one else would really go to the bottom of the shipworm problem, they would.

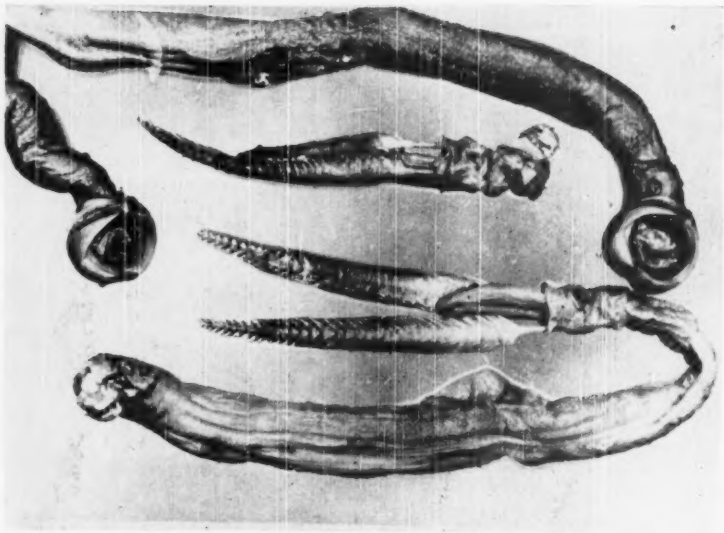
For instance, no one knows for sure *why* shipworms bore into wood. There are great missing chapters in their life cycles. Some harbors are free of them, some are heavily infested. Shipworms have suddenly appeared in areas where they were previously unknown, and then mysteriously have gone away. Certain wood treatments have been found to be effective against some kinds of marine borers, and then another species will come along that relishes the treatment as we like icing on a cake.



Sea lice look like a pale version of their land cousins. This is *Limnoria*, related to lobster and crab. It is the most widespread and destructive of all crustacean marine borers. It is about the size of a grain of rice.

As the Navy did not have the equipment or the personnel for the fundamental research that would be necessary, it has signed a contract with the famous Marine Laboratory of the University of Miami. Dr. F. G. Walton Smith, director of the Laboratory, and a group of trained assistants have already commenced their studies in a 104-foot Navy air-rescue craft, anchored in Biscayne Bay opposite the Coast Guard station. The little "scientific island" has been equipped with tanks, pumps, lights, biological tables, and other equipment.

Dr. Smith and his group have a big order on their hands.



Close-up of the teredo, or shipworm, revealing this molluscan borer in all its ugliness. Long, armored, paddle-shaped appendages pro ect the siphons, which take in food from the water.

The Navy wants to know not only the life cycle of these strange creatures, but it would also like Dr. Smith to come up with some new toxics or inhibitors to their attacks, and, *this would be the jackpot*, to discover some means of killing the larvae before they enter the wood. That is, to destroy them in their early, free-swimming stage without damaging useful forms of marine life, such as fishes, oysters, clams, and others, living in the same waters.

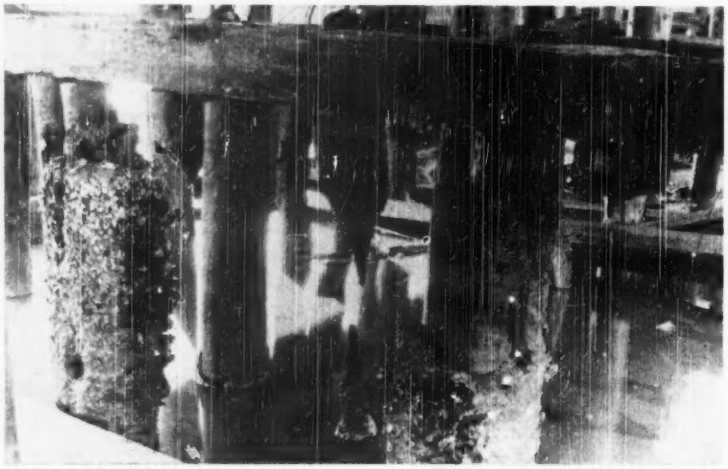
The experiments, which should require many months, are not to be confined to the study of wood damage. Your modern streamlined molluscan borer, it was recently learned with some alarm, has developed a taste for asphalt, bakelite, neoprene, manila, sisal and a considerable number of plastics! These, in addition to enough nibbling at inferior concrete and soft stone to give structural engineers a mild case of jitters, places the shipworm and his henchmen definitely on the list of subversive agents, even though their cards may not be on file with the FBI.

What do we already know about them and their habits? First, let us narrow the field to those marine invertebrates that drill into and damage timber, stone and other materials in salt water. This does not include the boring sponge, which perforates the shells of oysters, or barnacles, or other similar marine growths.

The most common borers fall into two groups: (a) the mollusks, related to clams and oysters, and (b) the crustaceans, related to crabs and lobsters. The adults vary in size from the almost microscopic to great snake-like "worms," one inch in diameter and several feet long!

There are several genera, consisting of many species, of which the most important economically (or should we say *destructively*, because none of them have any food or other value?) are: teredo, pholad, and martesis among the mollusks; limnoria, chelura and sphaeroma among the crustaceans. All of them are very ancient forms of life, having existed in much their present form long before man appeared on the earth.

By far the best known is the teredo, or shipworm, which is not really a "worm" at all, being more nearly related to the clam. We know that its life has three distinct stages — egg, larva, and adult — but there are still some unanswered questions as to the period between egg and larva. Some authorities hold that the

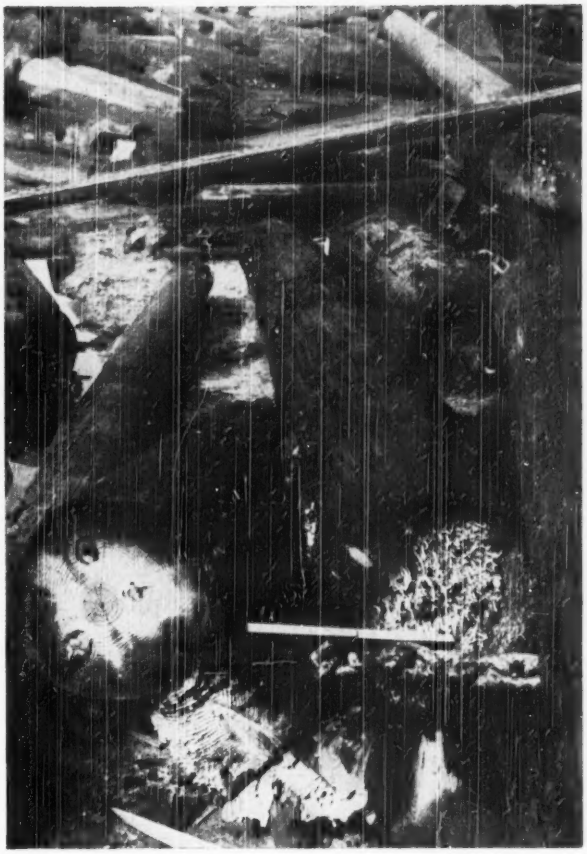


Danger! *Limnoria* at work. An example of what these borers can do, and did to a pier at the Navy Yard at Charleston, S. C. Note the pile eaten away to two sharply pointed ends.

eggs are fertilized within the parent and others say they are fertilized in the water after ejection by the parent. This important stage, when its life might easily be snuffed out, is one of the items on the agenda at Miami.

In the latter stages of larval development the shipworm is similar to the larvae of some of the other bivalve mollusks. It has two shells hinged at the top, into which it can withdraw for protection. During this stage, too, it can swim freely and is sometimes carried considerable distances by the wind and tide. When, after a month of freedom, it lands on wood, it is still only a fraction of a millimeter in size. By quick spasmodic opening and closing of the valves of its tiny shells it scrapes a depression, the size of a pinhole, into the wood and disappears from the outer world forever!

Once safely inside its new home, the shipworm undergoes an amazing metamorphosis. Two new shells replace the original embryonic valves, which are pushed off and discarded. Siphons for taking in plankton from the water as food, and for excluding wood dust and excrement, lengthen and begin to function. Two long, paddle-shaped appendages, called pallets, grow out from the tail of the creature and serve as a plug to the entrance tunnel. Their sharp ends discourage fish and other predatory creatures, and they also block off the outside world when the water becomes contaminated. The tiny tunnel entry is never enlarged, which is the reason why it is so difficult to determine when a piling or a bulkhead is infested.



Piling that looked sound until the Navy engineers probed. The pile at the right was only a shell filled with "spaghetti" as a result of teredo attack. These yellow pine logs had been treated with creosote, which was supposed to protect them.

Do shipworms live on the wood they so laboriously carve out? Some scientists think they do, but there is considerable evidence to indicate that, like almost all other bivalves, such as the clam, tunnels are mainly for the purpose of providing protection to the long, naked body of the animal.

The other marine borers, which operate nearer the surface, usually give warning of their depredations, such as tapering pilings or sagging bulkheads that are visible to inspecting engineers. The shipworm, however is a real seagoin' termite, and the damage he does often becomes apparent when it is too late.

For instance, they tell the story of a wooden sailing ship that tied up to what appeared to be a stout wooden pier in San Francisco. The captain and crew went to lunch, and when they returned to the waterfront an hour later they were startled to find no sign of either ship or pier! They had heard some pretty tall yarns about the activities of shipworms in the Bay, but this was too much. Yet shipworms *were* responsible for the disappearance of their ship! While the crew was at lunch the wake from a passing ship had snapped the teredo-riddled pilings off at their bases, and dock and fishing boat, lashed together, had gone out with the tide! Ship and dock were found floating in the Bay the next day.

Pilings twelve to fifteen inches in diameter have been destroyed in six months or less in such widely scattered places as Alaska, Newfoundland, Sydney, Nova Scotia, Florida, Puerto Rico, and New York.

Like the shipworms, their cousins the pholads enter wood in the embryonic stage and later enlarge their burrows to accommodate their imprisoned bodies. These small clams, whose entire body is encased in the bivalve shell, are shaped like a blunt carrot, with the broad boring face at the advancing end of the burrow. They range in size up to 2½ inches in length and an inch in diameter.

The damage done by the crustaceans is less spectacular than that caused by shipworms, since the destruction of the wood proceeds less rapidly and, being nearer the surface, it is easier to spot upon inspection. Never-

theless, they take a continuous and tremendous toll of wharf piling and other marine woodwork.

Of all the big family of crustacean borers, *Limnoria*, which somewhat resembles the wood louse or sow bug, is by far the most widespread and destructive. In fact, a few authorities blame *Limnoria* for the damage done also by another member of the crustacean gang *Chelura*. They say that *Chelura* is merely a sub-leasor, occupying tunnels abandoned by *Limnoria*.

Nevertheless *Limnoria* stands indicted on its own record — a series of depredations that extend from Arctic to tropic waters, and from east to west. Unlike shipworms and other Teredinidae, the crustacean borers all are tiny. Mr. Limnoria himself, in adult stage, is no larger than a grain of rice. Boring is done by a pair of strong mandibles, and he makes interlacing, branching burrows about one-twentieth of an inch in diameter. Because these seldom go deeper than a half an inch below the surface, the outer layers of the wood become finely honeycombed and spongy, so that it is easily worn away by wave action. Although this habit has the advantage of being more quickly detected than the boring of shipworms, it also exposes a new area of attack to fresh generations, which can reduce the diameter of piling as much as two inches in a single year.

Where there is little or no tide it is sometimes difficult to tell when *Limnoria* is at work. Its operations may extend anywhere from the half-tide level to the mudline, but they usually operate between low tide and half-tide, where the eroding action of the waves accelerates the breaking down of an attacked surface. As a result, piling tends to assume the well-known hour-glass shape between tide levels.

Limnoria has a common name, the "gribble," as does another member of the same tribe, *Sphaeroma*, which in Florida is known as "putty bug," because of its habit of eating the caulking from seams of boats. *Sphaeroma*, one of the "pill bugs," is unusual among marine borers in that it thrives in both fresh and salt water. *Chelura* is slightly larger than *Limnoria*, resembling a minute lobster. It does not initiate the attack, but often enlarges, for its own occupancy, the burrows made by *Limnoria*.

The marine borers do not seem to be bothered much by sewage, but industrial pollution definitely checks their activities. For instance, the Port of New York, which has been comparatively free of shipworms and their relatives, has, since it began a harbor cleanup drive, noticed their reappearance in various installations along the waterfront.

Therefore the experimental work at Miami holds widespread interest. Waterfront cities, railroads with long tidewater trestles, canal, bridge and pier maintenance crews, fishermen and yachtsmen, in addition to the U.S. Navy, eagerly await the results of these important biological studies. Rear Admiral J. F. Jelly, chief of the Navy's Bureau of Yards and Docks, says that all the project's findings will be made available to the public.

How soon this will be, neither the Navy nor the Miami scientists will hazard a prediction. A lot of lost time and guesswork must be overcome. Statistics and observations from other stations will be compared and correlated. But the indictment is clear, and the evidence against these sea goin' public enemies is overwhelming. They have outlived their usefulness, if they ever had any, and the penalty sought can hardly be anything less than extermination!

★

Interloper

By KATHARYN WOLCOTT

Though it happened long ago,
Even now I remember the moon,
A tossed feather above the trees,
The blue-green forest, twilight crow,
And Tim's voice saying, "Soon, now, soon
This is the time when they appear!"
There they were, in the hemlock-brush,
The doe and her fawn; it seemed we spoke
Across the dappled, sun-gold hush.
Knee-deep in brambles, statues, they stood,
Carved of warm stone. Then tension broke,
They leapt from the clearing into the wood

Many, many years ago!
Yet even now I feel the shame
When, turning to share this tense tableau,
Moment before the timid flight,
I saw Tim lift his gun, take aim

Gold-Faced Digger Wasp

By A. C. PARSONS

Photograph by the author

The golden-faced digger wasp at the entrance to her gallery. She is kicking dirt away from the excavation.

One warm July afternoon I was lying in the shade of the chestnut oaks that line the sandy bluff above St. Nicholas Creek, in southern Maryland, enjoying the breeze coming in from Chesapeake Bay. Sleep had almost come when a deep, humming sound caused me to open my eyes and look up just in time to see a great wasp, with a large grasshopper clasped against her abdomen, pass a few inches overhead and land on the sandy bank behind me. Here was a new experience, driving away all thoughts of repose. The subsequent research, such as it was, required three pleasant days, or parts of them, at least.

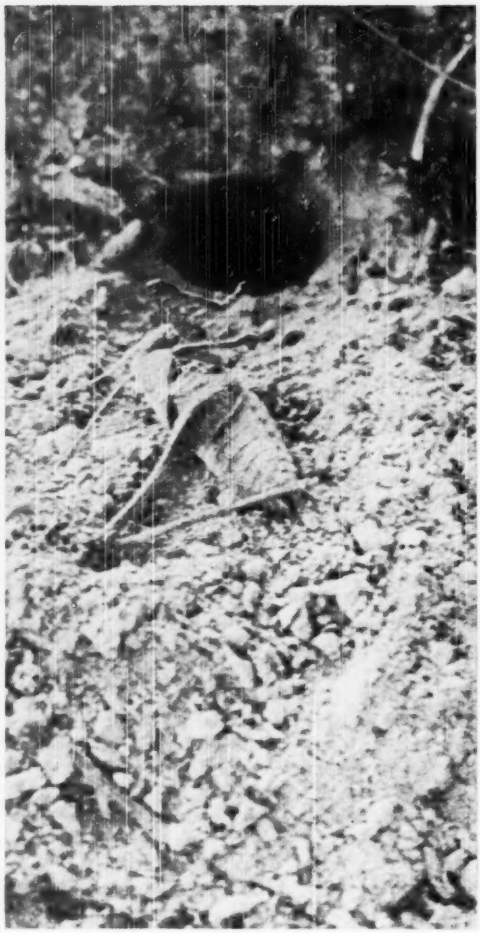
In the bank was a burrow nearly an inch in diameter. On the pile of dirt from the excavation, just about an inch from the opening, lay a paralyzed grasshopper. Peering from the burrow was a large wasp, later identified as a golden-faced digger wasp, *Ammobia ichneumonea* or *Chlorion ichneumoneum*, a member of the family of Sphecidae. Most of her clan preys on the larger insects. One, *Sphecius speciosus*, the great gold and black cicada killer, seizes only cicadas, while other members of the group hunt for aphids, spiders, flies, katydids, crickets and other insects. All are solitary or colonial in their habits. Each individual has her own storehouse, although many other wasps may live nearby in the same sandy bank or grassy meadow. They do not live a community life, as do the yellow jackets or white-faced hornets. Some have their homes in the ground, others in the pithy stems of sumac or rose bushes, and one variety persists in plugging mud into the keyhole of the back door of my garage each summer. They all have a single purpose, in catching and paralyzing other insects, which is to provide a supply of fresh, live food for the young that will emerge from the eggs that the members of the family Sphecidae will deposit on their victims.

Many times we have seen the giant cicada wasp sting her prize in the thorax and carry it up a tree or post, from which she can glide down to the entrance to her underground storehouse. When she lands near the entrance, she disappears into the burrow with her victim as quickly as possible. The golden-faced digger is different in two respects — she actually flies with her heavy load and she does not carry it into the burrow at once. On several occasions during those three days I watched this wasp, and others, fly across two hundred yards of open water with a grasshopper slung underneath. Each time the wasp dropped down within an inch or so of the burrow, and each time she deposited the grasshopper so that its antennae were across the entrance or within easy reach of it. Then she popped head first into the hole, turned around quickly, put her head out and looked at her prize for some seconds. Occasionally she varied the procedure by backing into the door, but at least she had to gaze with pride upon her catch each time she came flying home. Then, apparently satisfied that everything was in order, she seized the grasshopper's long antennae with her forward pair of legs and whisked him into the dark depths.

Although we could not see into the tunnel, which dropped almost straight down seven inches and then turned, we do know what happened there. The wasp took her prey into a cell already prepared at one side of the main passage, and then deposited an oblong egg on the neck of the grasshopper. In a few days that egg would hatch and the larva would feed on the hopper until it is but a skeleton, while the larva is big and fat. Then the latter spins its cocoon, in which she will lie, snug and warm, until the following summer, when she will emerge as another wasp to hunt grasshoppers in her turn.

As soon as the egg was laid, the wasp set out again to hunt. How many grasshoppers she carried into the tunnel in the sand bank we do not know, since we did not excavate to find out, but we saw her come sailing through the air with five, four of which she found acceptable and took into her home. The fifth proved to be the most interesting of all. She dropped this one on

A long-horned grasshopper, paralyzed by the wasp, lies at the entrance to the burrow. There the wasp deposited her prey for a few seconds before disappearing into the depths, finally to return and gloat over her catch until ready to deposit it finally in the gallery.



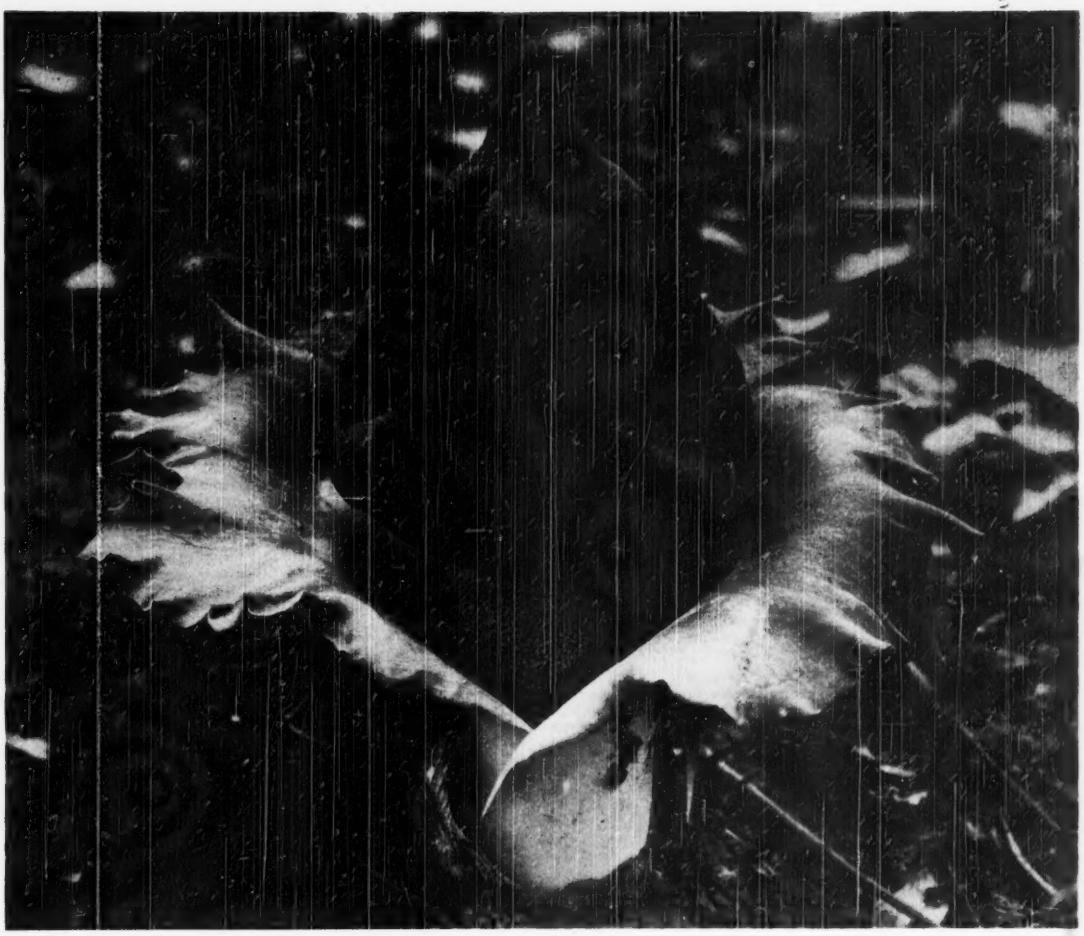
the mound of sand as she had dropped the other four. She entered the tunnel and popped her head out. But this time something was wrong. Just as her head appeared, a small, fly-like insect perched on the grasshopper for a second and then flew away hurriedly. The wasp emerged, seized the grasshopper with her legs, carried it to the edge of the pile of sand and pushed it over. Following that, she went back into the hole, where she remained for some time. We suppose that the insect that landed on the wasp's property was a tachinid fly, one of the type that lays its eggs on the victims of the Sphecidae so that their larvae may devour those of the wasps, but the action was so rapid that we were not able to identify the fly positively.

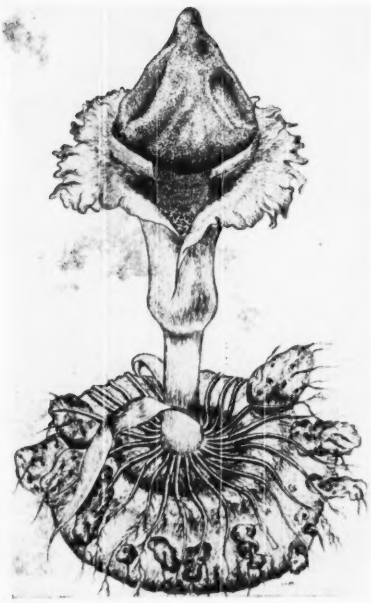
While the wasp was out of sight in the tunnel we picked up the discarded hopper and placed it on the sand so that the antennae were across the entrance, just as we had seen the wasp do. When she emerged, a few moments later, she immediately pushed the grasshopper aside and retreated into the hole. Three more times we repeated the process and twice the grasshopper was thrown to one side. The third time the wasp apparently became tired of this foolishness, for she grasped the hopper with her two middle pairs of legs and took off with it. We watched her line of flight and saw her drop her burden in a tangle of blackberry and cat briars about fifty feet away. She circled and came back home, seemingly well satisfied with her solution of the problem of the grasshopper that would not stay discarded. She appeared to know that that victim was dangerous to the welfare of her progeny, and she was not going to be tricked into taking it into her home.

After the third grasshopper had been stored away, *Ammobia* found that her subterranean warehouse had to be enlarged before any more victims could be accommodated. Consequently, she began to dig. We could hear her buzzing and humming somewhere in the dark tunnel and soon after we saw sandy soil appear at the entrance. She seemed to be pushing the loose earth with her head until it was just outside the door. Then she came out head first, turned so that she faced the entrance, and, with two or three swift motions with her rear pair of legs, she sent the dirt tumbling down over the mound. Nearly a half-hour was consumed in this work of excavation, and then she departed once more for her hunting ground in the patch of marsh grass.

By late evening of the third day of our observations the wasp had filled the gallery with grasshoppers and was ready to seal the entrance. We did not see her do this, unfortunately. We saw her come in with a grasshopper, go through the usual ceremony and depart into the depths. At that moment we were summoned to dinner at the cottage. When we returned, about an hour later, the door had been tightly closed with earth and the wasp was not seen again. We did see many newly excavated tunnels in the neighborhood, and we also saw many more wasps of the species searching the marsh grass and the fields of young goldenrod for grasshoppers to take home. Was our *Ammobia* one of those that had made new galleries, or had she finished her life's work when she sealed the door? We do not know.

Photographing this wasp was not easy. The burrow was in constant shade and wasps are seldom quiet. *Ammobia* proved no exception. Although she remained outside the burrow for many seconds at a time, she constantly moved her wings and bounced around nervously, as most wasps do when on the ground. Of the twelve exposures made, only one was made at the right moment. The others showed a blurred image. We tried to get some pictures of her as she peered from the mouth of the burrow, but she moved every time. One twenty-fifth of a second, at f:5.6, is not sufficient to stop motion. We shall try it again, and hope for success.





The striking "Black Lily" of tropical northern Australia, shown above at its prime. The strawberry-like spadix is red-purple, and the encircling leaf is yellow streaked with glistening green. At the left is a drawing of the entire plant, showing the large, starchy and toxic tuber, valued as food by some aborigines.

The Curious Black Lily

By NORMAN LAIRD

Photographs by the Author

AUSTRALIA is renowned for its curious plants and animals. None is more curious than the "Black Lily," *Amorphallus*. The top of this Australian plant bears a purplish portion — not unlike a monster strawberry — known as the spadix. On the stalk below the spadix are some hundreds of closely packed staminate flowers; below these are the fewer, black, beady clusters of pistillate flowers. The whole is surrounded by a specialized leaf known as the spathe, bright yellow streaked with candescent green. The above-ground inflorescence of this plant lives only ten or twelve days. As it dies, the spadix assumes various grotesque shapes caused by natural drying of moisture in its tissues. When fresh, the spadix measures up to twelve inches in diameter; the spathe about eighteen inches. The plant grows in colonies of from three to forty members. Its range is tropical northern Australia, in the regions of crocodile-infested rivers, and in hot, dank places near to inland creeks of Arnhem Land.

Known by natives throughout Polynesia as the poison "Pia," it is, however, described by Europeans as the "Black Lily" because of the dark color of the

hordes of insects settle on the spadix they become partially anesthetized by the fumes. They either fall or are pressed, by sheer weight of numbers, into a slimy secretion in the cup-like recess at the bottom of the spathe.

In this temporary prison, or death chamber, a thousand insects, or more, drunkenly writhe and heave, released only by the subsidence of the stench. By this time the plant has accomplished its purpose of fertilization.

Certain Australian aborigines consider the tuber good eating and make a point of looking for it on their yam forages. In some Polynesian communities it is cultivated and cooked a day or two before eating. However, the tuber, which often weighs up to eight pounds, is unsatisfactory food for the civilized stomach. In its raw state, it is starchy, highly toxic to cattle.

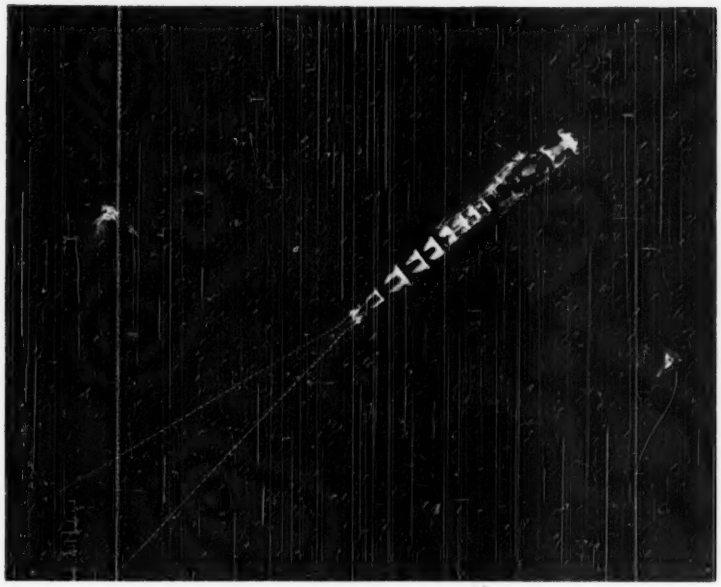
Above, the plant some days after fertilization, the spadix beginning to wither and turn black. In twelve days, or less, it is a piece of decayed vegetation. Below, after the disappearance of the flower, mottled green and gray shoots are sent up; the young leaves and stalk, which flourish during monsoonal rains and wither when dry weather comes, completing the plant's life cycle.

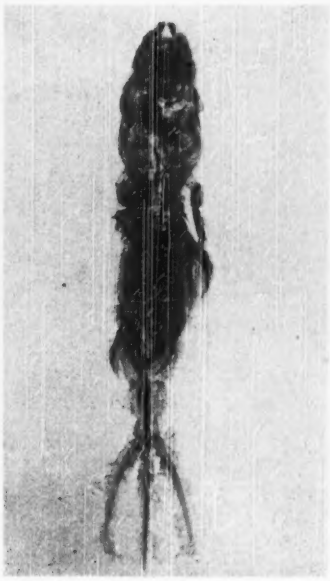
dying spadix. Australians simply refer to it as the "stink-lily," or carrion-plant. Those unaccustomed to it, give it a wide berth, often assuming that it has dangerous properties.

Monsoonal rains herald the plant's uprising, during which time it grows at a magical pace to mature in about five days. Beginning at the sixth day of its brief life, it breathes out, between dawn and sunset, a horrible stench as of putrid flesh. I know of no other living thing in the realm of Nature that is quite so nauseating. At midday, in the intense tropical heat, it is most active and most unbearable. The stench subsides at nightfall.

It is well known that bees, wasps, butterflies and other insects are attracted by sweet-scented vegetable odors, and that certain insects are attracted by putrefactive odors. In most cases there is some compensating feature for insects of either group; bees are rewarded with pollen, wasps with nectar, dung-beetles with dung. The Black Lily is a plant trickster.

Attracted by the stench, blowflies and beetles make their way to the carrion festival with the unerring instinct of homing pigeons. They land on the hot, sticky surface of the spadix, full of impatience to glut themselves on noisome nothingness. As the





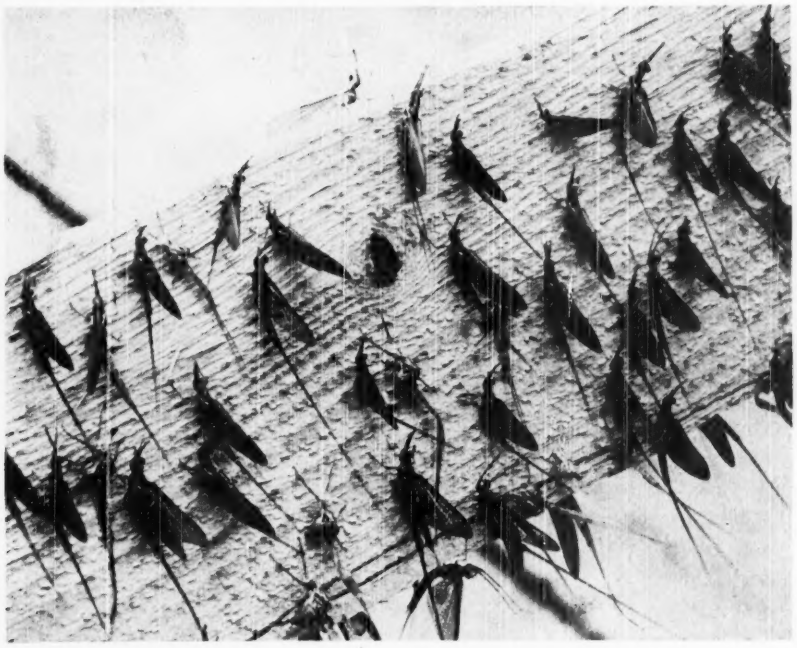
Adult for A Day

By WILLIAM J. JAHODA

MANY are familiar with the appearance of adult mayflies. Fishermen, in particular, note the evening swarms, and attempt to simulate, with tinsel and feather, their delicate beauty.

In the region of the Great Lakes, the early summer emergence of these insects is a nuisance, as well as somewhat awesome. The Great Lakes country produces many genera and species of mayflies. *Hexagenia* is the most numerous in western Lake Erie, and during periods of peak emergence, they swarm to the shore in such numbers that piles of insects several feet deep beneath city lights are a frequent sight in the morning.

Hexagenia is one of the burrowing mayflies. Eggs sink to the bottom, and upon hatching the tiny larvae immediately start their burrows. These burrows are "U" shaped, and beating of the larvae's abdominal gills causes a cur-



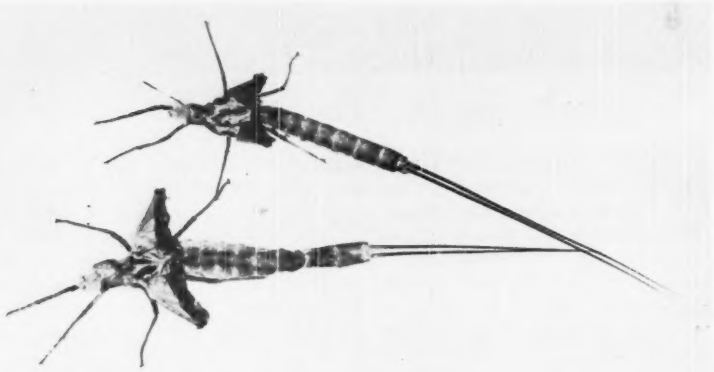
Above, left, we see the extremes in size of the mayflies found in the western Lake Erie region. The small flies are the three-tailed members of the genus *Caenis*, the large fly is a female *Hexagenia rigida*, about three inches overall. Above, right, is the cast skin of *Hexagenia*. These skins float in large numbers on the surface of the water. Left are many flies of this species, the relatively short-tailed, milky-looking ones being subadults, the darker, clear-winged individuals are adults.

Female sub-adult of *Hexagenia limbata*, note the milky appearance of the whole insect. Cast skins of the sub-adults, from which the sexually mature adults emerged. Note the shriveled remains of sub-adult wings, below.

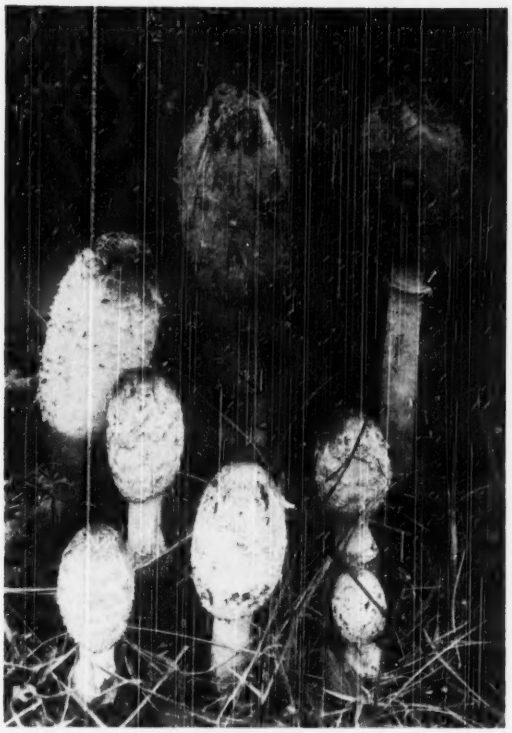
rent that brings food to their jaws.

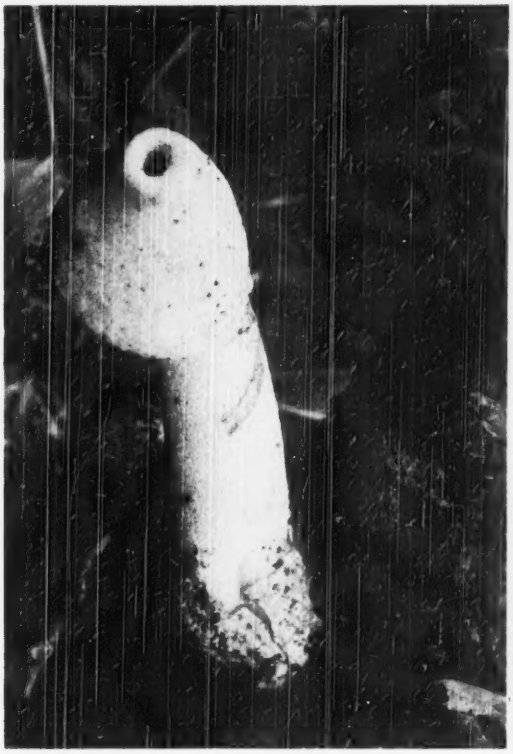
Larvae of *Hexagenia* spend two years in the mud, and as much as fifty feet under water. By time of emergence, they may be one and one-half to two inches long. In early summer they come to the surface, emerge and fly to the shore, leaving nymphal skins floating on the surface.

Upon emerging, the sub-adults fly to the nearest shore and land upon trees, houses, the ground, and elsewhere. They are quite chalky in appearance, their wings with a milky, translucent cast. They stay quiet for approximately a day until the time for the final molt comes. This molt is a thing of wonder. The sub-adult, standing until this moment with its wings upraised, drops them to its side; the old skin splits at the back, and the adult spasmodically emerges.



Adult male and female of *Hexagenia limbata*. Although the body size is about the same, the male has a somewhat longer tail and is much darker in coloration than is the female. The emerged, sexually mature adults are things of beauty, with clear wings and with legs and caudal filaments about twice as long as in the sub-adult.

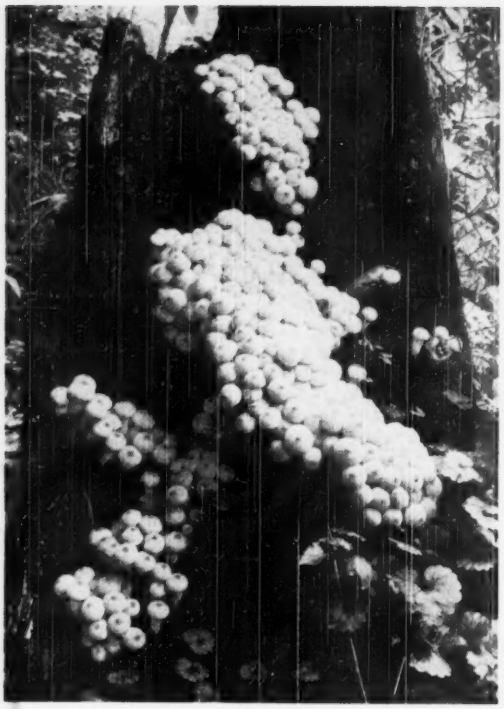


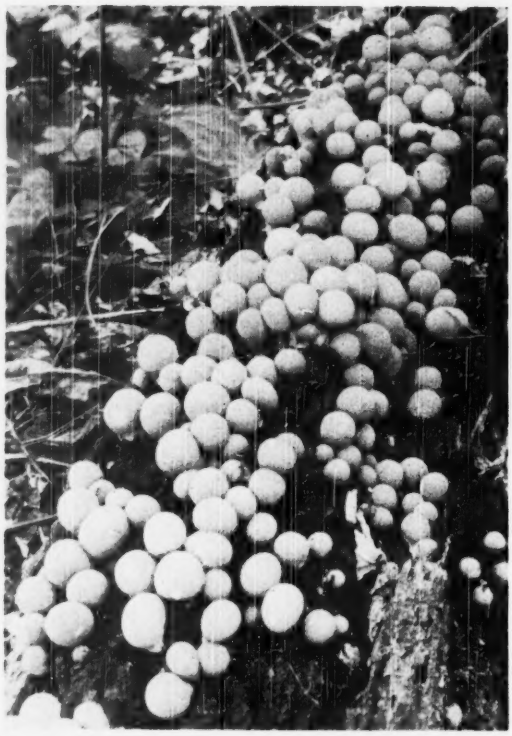


The ink cap mushrooms belong to the genus *Coprinus*, and all of them are not only edible but highly favored for the table. They are ephemeral, however, and should be gathered in the early morning when their flesh is still firm and white. All of the species are recognizable from the shape of their caps, which are oblong or nearly cylindrical. Shaggy mane, *C. comatus*, shown at the upper left, is typical of the ink caps, and one of the best for eating. Above is one of the stinkhorns, *Dictophora ravenelii*, interesting but malodorous to a degree that definitely is no recommendation of their use as food. Their odor attracts various flies, as does the Australian "Black Lily" pictured elsewhere in this section, the insects spreading the spores. It is unlikely that this fungus is poisonous. At the left is another stinkhorn, *Ithyphallus impudicus*, also smelling like carrion. These two are typical.

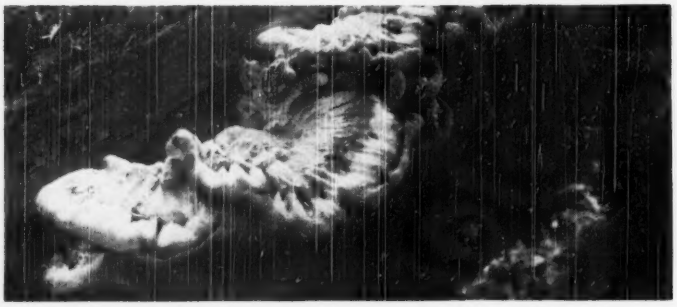
Mushrooms— Edible and Otherwise

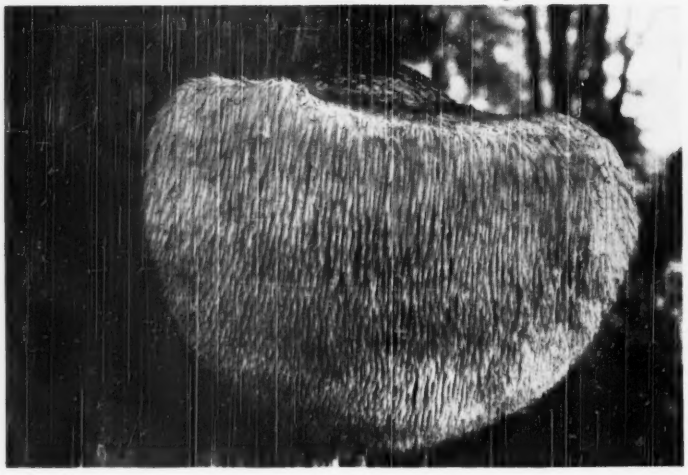
Photographs by L. W. Brownell

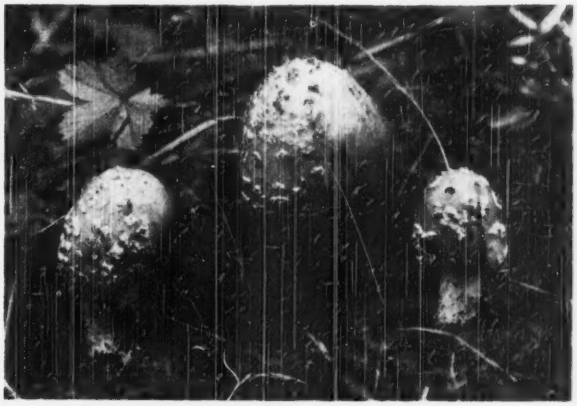




Above, masses of good eating, two examples of the puffballs, *Lycoperdon pyriforme*, left, and *L. subincarnatum*. For eating, the puffballs are collected in their young stage. Right is one of the many shelf fungi, *Polyporus sulphureus*, edible when collected young. Below are two members of the genus *Hydnum*, *H. caput-ursi*, left, and *H. erinaceus*. None of this species is poisonous and most of them are deliciously edible. They are unmistakable and often grow to weigh four or five pounds. Fungus epicures enthuse about them.

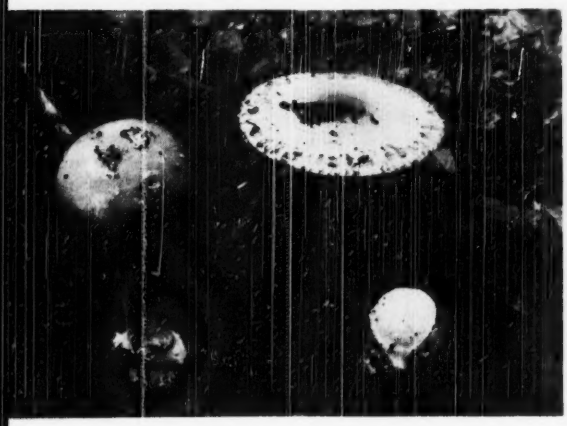


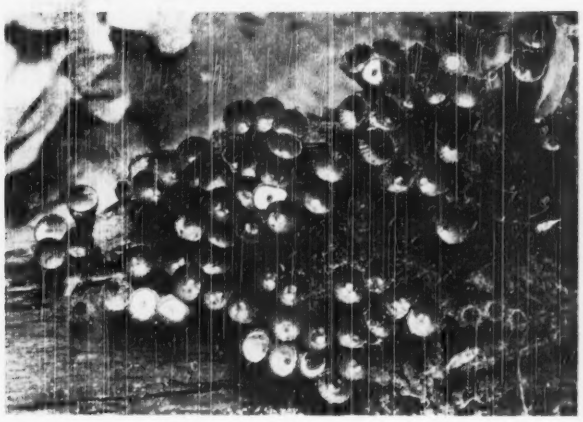




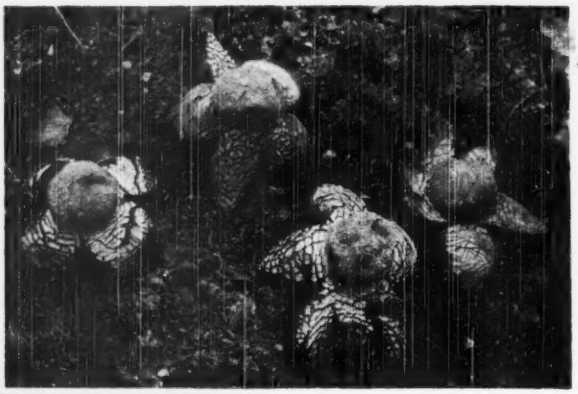
Among the fungi the morels are unmistakable, and all of them are not only edible but of delicious flavor. The palatability of the morel above is evidenced in its scientific name, which is *Morchella deliciosa*. While the majority of the fungi are found in late summer and fall, this morel grows in the spring and is found under trees in damp places and during wet weather. To the right, above, is a beautiful mushroom, but one to be avoided, for it is the poisonous *Amanita muscaria*, the fly amanita, so named because flies are attracted to it and die after sipping it. This mushroom can be mistaken for the non-poisonous *Amanita caesarea*, also called "food of the gods." Unless you know your mushrooms beyond doubt, it is best to take no chance.

At the right is *Amanita verna*, often known as the "destroying angel" and probably the most deadly of the mushrooms in this genus, although it is a beautiful growth. Directly below is another of the poisonous amanitas, *A. phalloides*, known also as the "death cap." It is another extremely virulent species, as the name indicates. One may avoid these dangerous fungi by noting the cup, or volva, from which the stem arises, and an encircling band, or annulus around the stem, resulting from the tearing away of the veil that connects the edge of the cap with the stem in young specimens. Other genera and species have one or the other of these distinguishing marks, but no other has both. At the right, below, the bird's nest fungus, *Cyathus striatus*, a peculiar and interesting fungus growth. When young they are enclosed at the top with a white film, which soon tears away, disclosing the usually three "eggs" in the nest-like formation. These are the cases containing the spores.

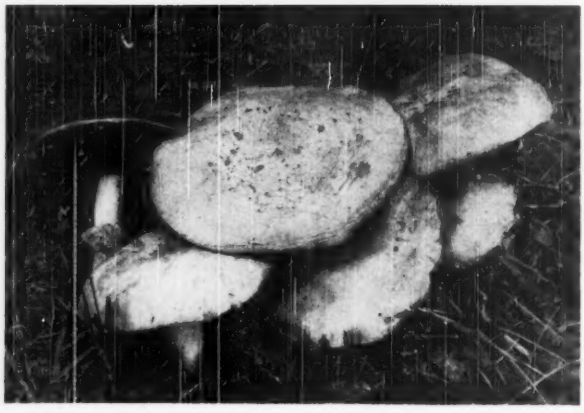




The earth stars are members of the genus *Geaster* and are the most picturesque forms of puffballs. They are formed buried in the ground. The covering of the pouch is double, the outer part thick and leathery. When the fungus is mature, this outer coat bursts to form four or five separate lobes, which turn backward and lift the inner ball into the air upon its starshaped throne. While interesting, these fungi are of no value as food, but are non-poisonous.



One of the common bracket fungi is *Polyporus* (or *Fomes*) *applanatus*, at the left. It is often seen growing on the tree trunks, often quite a number of the shelves on one tree. Its immaculate and solid underside makes an excellent surface for stenciling, and specimens are often found for sale in curio shops with designs etched upon them. Most people, however, will prefer to see them on the trees they have selected for their brackets



Commonest of the species of edible mushrooms are the members of the genus *Psalliota* (or *Agaricus*) and one of these is *P. rodmani*, or Rodman's mushroom. With *P. campestris* it makes a duo of field or meadow mushrooms, and these are the forms most usually grown domestically for the market. They have pink gills when young, although these turn brown as the age of the fungus increases. Probably these species have pleased more palates than any others.

Wyoming Jackson Hole National Park

At long last it would appear that the controversy about the Jackson Hole National Monument is heading for solution. The answer seems to lie in S.3409, a bill dropped into the U. S. Senate hopper by Senator O'Mahoney, for himself and for his colleague from Wyoming, Senator Hunt.

There is nothing to be gained by reviewing again the history of the controversy that has raged about this area, and the politics and personalities that got so involved in it as to obscure the greater issue of the preservation of the area. If all the words that have been wasted arguing about this question could be laid end to end they would reach from pole to pole — which would be a good place to lay them.

The proposed bill provides that specified lands within the Jackson Hole National Monument and the Grand Teton National Park be established as the Wyoming Jackson Hole National Park. While it seems rather too bad to lose the designation of the Grand Tetons, so spectacular and distinctive are the peaks of that mountain mass, they will still be there. If it makes Wyoming happy there appears to be no point in quibbling about the name.

Very minor adjustments in the boundaries of the Monument as originally designated are made by the bill. A bit is chopped off in the vicinity of Buffalo Fork. To the south the Gros Ventre River provides a logical boundary north of Jackson.

Provision is made for reimbursement of the State of Wyoming for tax losses in accordance with what appears to be becoming an accepted and acceptable program.

Chief center of recent controversy on the Jackson Hole issue has been the manner of control of the elk herd. Coming down from their summer range for the winter, the elk pass through the Monument, and, in the past, shooting has taken place on what are now Monument lands, and will be Park lands when this bill is enacted. Wildlife is protected within all areas under National Park Service jurisdiction, which, of course, set the stage for differences with the Wyoming Fish and Game Commission, which feels it holds a proprietary interest in the herd.

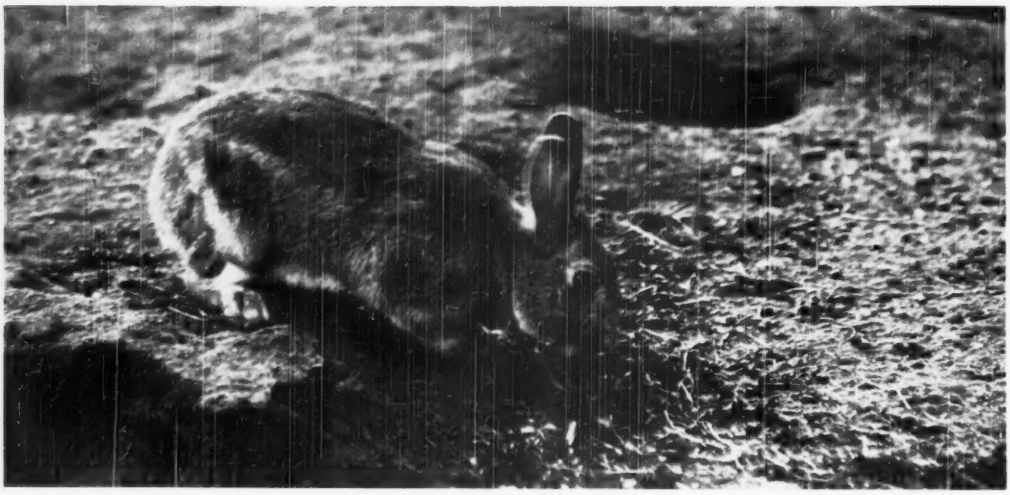
Besides sport harvesting of a certain number of elk, the herd has to be kept within bounds as to size. Otherwise it will eat itself out of house and home, so to speak, and increase beyond the limits of its habitat. The past reduction of the herd has been, in large measure, through hunting, and a part of that hunting occasionally has been a firing-line sort of slaughter at certain points along the route of the movement of the herd. This sort of thing would be completely eliminated by creation of the Park or, at least, should be.

On occasion, in the past, the National Park Service has found itself confronted with an excess of animals in large animal herds under its jurisdiction. Increases brought about by complete protection have raised animals to numbers beyond the limits of their range. Reduction of numbers has been necessary, and this has been achieved by hiring competent gunners to cull out the necessary numbers under supervision, the meat resulting being given to the State in which the Park lies, or to Indians or institutions.

The Jackson Hole elk herd may require such reduction in the future, and, lacking other provision, this would be carried out in accordance with previous practice. In this case, however, there *is* other provision in the pending bill. The herd is placed under the jurisdiction of the Wyoming Game and Fish Commission and the National Park Service. They are charged jointly to prepare and recommend to the Secretary of the Interior and the Governor of Wyoming "a long-range program and a yearly plan to insure the permanent conservation of the Jackson Hole elk herd." When found necessary this would include controlled reduction of the elk in the Park "by hunters licensed by the State of Wyoming and deputized as rangers by the Secretary of the Interior." Only one elk may be killed by any such licensee and deputy, and the carcass shall become the property of the gunner. Each holder of a license must be "qualified and experienced," whatever that may mean. This controlled reduction is limited to specified areas.

From the point of view of precedent and past practice, this is the part of the bill about which we are the least happy. The plan devised is obviously a bit of face-saving, both on the part of the Wyoming Game and Fish Commission and the National Park Service. We can foresee headaches as to when, who and how many, with respect to both hunter-deputies and elk. And whatever the wording of the bill, it is still sport-shooting on a National Park Service area, as well as meat-shooting by individuals. We think it is wrong.

Nevertheless, however much we dislike to see principles compromised, this Jackson Hole controversy should be settled. So long as it remains dangling there will be no funds to administer the Monument, and shooting will go on there anyway. The dual jurisdiction of the herd, the development of control programs on the basis of careful investigation, and control of the reduction process are some reassurance. So we hope action will result, and the animosities of this controversy decently interred. However, we do not regard this elk solution as precedent, and will fight to the last ditch against any application of a like device to any National Park Service area.



One of many. From a consignment of twenty-four rabbits introduced into Australia, the rabbit population, unchecked by natural enemies, has grown to be a national pest requiring a variety of methods for its control. Still the rabbits multiply.

Rabbits, Rabbits and Rabbits

By ROBERT STROTHER

How the introduced European rabbit, *Oryctolegus* has overrun Australia emphasizes the hazards inherent in the introduction of exotic species where Nature did not intend them to be. New Zealand has had similar experiences with such introductions. In the United States the house sparrow and the starling are examples of introduction we could have done as well without.

FOR THE better part of a century Australian rabbits have been the object of a war of extermination — a war fought with weapons ranging from boomerangs to bulldozers — and at this moment the animals are more numerous than ever. They are, in fact, a scourge on the land. To compute their numbers would require the kind of figures you see in the national budget.

Even before the first rabbits were brought to Australia by settlers, who naively thought they would form a welcome addition to the game population of the continent, it was known that they could multiply at an astonishing rate. But nobody imagined that the mild-mannered little beast could operate so successfully on the principle of geometric progression that he could overrun a continent within a few years.

Four weeks after they become acquainted, one pair of rabbits has an average litter of six offspring. Fifteen weeks later, the does in the litter are ready to produce offspring of their own. This they unhesitatingly do, if conditions are right. So, in turn, do their progeny, so that by the end of the first year there can be four generations, totaling 326 healthy and progressive rabbits.

This is all very tidy and manageable so far — but watch! The 163 females in the thriving little family group go to work with a will, and by the end of the second year the two initial rabbits can beam benignly on 33,138 descendants.

The process gains real speed in the third year, during which people in the area are likely to start complaining of a plethora of rabbits. As the year closes, the presence of some 8,768,096 of them could hardly be ignored, and the hopelessly outdistanced human race considers that it is high time something be done. And so it is. If things were allowed to run their course through year four, the number could reach 1,437,877,744.

All this was mere theory until Australia offered rabbits the ideal conditions for demonstrating the full scope of their talents. Here was a whole continent just waiting for a pair of rabbits.

Historians date Australia's rabbit curse from the year 1859, when the clipper ship *Lightning* arrived in Hobson's Bay with twenty-four of the little animals consigned to Thomas Austin of Barwon Park. At first they were rigorously protected. One chap who snared and devoured a rabbit owned by John Robertson was fined ten pounds; two years later Robertson was the worried owner of at least 25,000 rabbits, and

One method of rabbit control in Australia is through introduction of cyanogas in dust form into the warrens of the animals in the hard, high country. This campaign is a year-around program.

had spent 5000 pounds in a vain effort to stamp them out. Austin killed 20,000 rabbits at Barwon Park in the course of six years and figured at that time that there were at least 10,000 more on the grounds. The state put a bounty of a shilling a head on them. Australia's war on the rabbit had begun. It has gained speed ever since, but the rabbits are well ahead and improving their lead.

In Australia it is illegal to raise rabbits, and anyone who did would be regarded as a maniac, as well as a criminal. The rabbits there are quite capable of looking after themselves: they ask nothing of man except that he turn the country over to them. They have no natural enemies, since nothing in Australia, including the Australian people, cares much for rabbit meat. The dingo, a species of wild dog, prefers mutton to rabbit. Hawks do eat an occasional rabbit, but have long been satiated with that diet and prefer more delicate foods.

Determined to exterminate the rabbit and restore the usurped land to livestock grazing, Australians started out with high hopes to isolate the rabbits in the infested areas, and so protect the rest of the vast continent from their depredations. It was thought that the isolated rabbits could then be dealt with at leisure. In 1880 the state of Victoria started the construction of several hundred miles of fence to bottle up the great hordes that were ruining the pastures and the sheep industry.

Work on the great barrier fence was begun with vigor, and much ingenuity was expended to make it, in the hopeful phrase of the time, rabbit-proof. The lower six inches of the 42-inch netting was buried in the earth to forestall burrowing. A path 50 feet wide on each side of the fence was cleared of trees and shrubs. Swinging gates of netting were placed in gullies and rivulets, for Australian rabbits are adept swimmers.

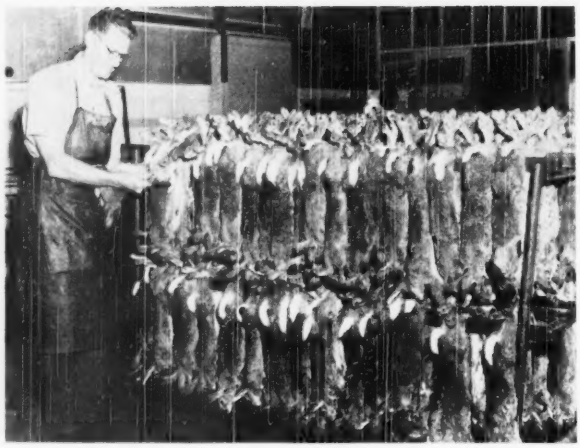
It looked for a while as if the bunny was to be stopped — at a cost of several hundred thousand pounds. But large numbers of rabbits had made an end-around play before the fence was finished and were flourishing as cheerfully on one side of it as on the other. The fence, incidentally, was at one time patrolled by men mounted on camels. Some of the camels escaped to the bush and established families. At last reports these were living as happily as is possible with these dour animals.

Other big, state-sponsored fencing projects met the same fate. Thousands of miles of rabbit-tight netting were erected, with little result. Individual farmers and ranchers put up many additional thousands of miles of netting, aided by non-interest-bearing loans from the state. These fences were more successful, and are, in fact, considered indispensable to any effort to hold down the rabbits. The trouble is that they are expensive and hard to maintain. Experts estimate that 300,000 miles of new fencing is urgently needed right now.

Most of Australia's netting is made by the Lysaght Company, where a five-year strike has just ended. This has left a critical situation. The Lysaght plant's output, now that production has been resumed, is from 50 to 70 tons per week, against an estimated shortage of 50,000 tons. Imported netting is no answer, since the cost is at least double that of the domestic product.

In Australia the rabbit is a fastidious eater, preferring the best pasture and ignoring noxious weeds. Fencing on a grand scale has been tried, with indifferent success.

While rabbit fur for felt and rabbit meat for export are by-products of the great number of the animals, return from these sources do not outweigh the pest consideration.



All the Australian states have established Pasture Protection Boards with wide powers to deal with farmers and ranchers deemed insufficiently active in the war on rabbits. Some are negligent or indifferent, others have such vast tracts of land that, even with heavy rabbit devastation, there is still enough grazing for their sheep. Moreover, there is a considerable vested interest in the trapping of rabbits for meat — mostly exported to England — and for fur. Felt for most of America's hats is made from Australian rabbit hair. But the total annual rabbit trade of fifteen million pounds is small compared with the damage rabbits do to the country's economy as a whole — estimated at at least 50 million pounds a year.

Rabbits compete for forage with sheep, and sheep, in the forms of wool and mutton, are Australia's main crop. Six rabbits will eat as much as one sheep, and when rabbits have grazed closely, as they do in dry times, there is nothing left at all. They eat the grass down to and including the roots. The denuded lands erode and the topsoil blows away. Some rabbit-blasted areas can be restored, but only at the cost of several years' work and large sums of money.

In drought years rabbits migrate in numbers so vast that entire hillsides appear to be in motion. The rabbits flow over the countryside in their millions, eating the last vestiges of vegetation and even climbing into trees to eat bark left by earlier migrations. The trees die along with the grass. The land they leave behind is desert where the only living thing to be seen are clouds of blowflies working on the carcasses of dead sheep, cattle and rabbits.

During years of normal rainfall, the damage is less obvious. Rabbits are considered excellent judges of rural real estate, selecting the best and most fertile areas for their homes. There are records of 13,000 rabbits being killed in one 1000-acre paddock, as a fenced field is called in Australia. And when you consider the six-rabbits-to-one-sheep forage ratio, you can see what that means in the farmer's economy.

The battle against rabbits has passed through many phases, including poison gas and germ warfare, to the present bulldozer stage. Some farmers are optimistic enough to predict that the bulldozer will be the victor. The method — the most successful yet devised for rabbit extermination — calls for the area under treatment to be tightly fenced with one and one fourth-inch rabbit netting. All top cover — such as hollow logs, blackberry brambles, and weed patches — is removed from the field. Then thistle root poisoned with strychnine is placed in the burrows. This eliminates a considerable number of rabbits, but is only a preliminary to the main assault by bulldozer.

The bulldozer, flanked and followed by dogs and by men armed with shotguns, rips up the rabbit warrens. Some of the animals are suffocated in their nests. The others emerge in terror and are picked off by the hunters or caught by the dogs. Once a paddock is cleaned out in this way, the pest can be kept under control if the farmer and his dogs are vigilant enough in patrolling the fences and in catching the stray rabbits that reappear after the slaughter.

Says W. J. Smith, Pasture Protection Officer for New South Wales: "If everybody works together, we can lick this thing. Of that, I haven't the least doubt in the world."

Smith directed the rabbit war in the Young District of New South Wales for nearly 25 years before he was promoted to his present job. During that time the number of sheep the district can support was increased from one million to two and a half million. "We were able to eliminate the rabbits," he says, "because we had local boards that were willing to enforce the law against the blokes who let their rabbits multiply all over the place."

Most of the farmers seem to agree that, with co-operation, they, can beat the rabbit problem, but they say the immediate future is dark.

"Not enough netting, and that too dear," said John Walton, a 40-year-old farmer in New South Wales. "Netting that cost three pounds for 100 yards costs 8 pounds now, and you can't get it. Can't get labor to put it up either. The bunny is a menace all right, but we could keep him down if we had the netting. But perhaps I shouldn't complain. I got all the bunnies out of that paddock you are looking at now."

Even as he waved his arm in a wide sweep to indicate the rabbit-free area, a rabbit flashed across an open space between the blackberry brambles. Walton made a wry face. "My word," he said, "awkward, that is. Can't imagine how that one got in. Have to go around the netting (Continued on page 331)

You have never seen the postage stamps reproduced with this article on United States mail. Indeed, it is unlikely that you ever will — at least not these precise designs. They do, however, represent a suggestion by the author — a proposal well supported by the article that accompanies them. Perhaps, one day, the birds and mammals of the United States will be accorded official post-office recognition equal to that in many other countries. Perhaps, one day, we will have . . .

Wildlife in the Mails

By E. R. KALMBACH

Illustrations by the Author

FEW of us have not licked the backs of many postage stamps. In doing so, the designs on the front have not escaped our attention. Those on our regular issues soon become so familiar as to pass unnoticed, but the parade of commemorative stamps and special issues, however, makes one wonder what will come next. With the first volunteer fire department and the barnyard rooster having been immortalized in recent issues, the question arises, "Are we running out of distinguished Americans or notable historical events?" These, we are told, are the criteria on which the designs of commemorative issues are based.

Incoming mail brings stamps of foreign origin, their designs often fascinating. And it is evident that Nature in its varied forms has a strong appeal in many foreign lands as a fitting theme for the design of postal issues. Scenic views, plants of economic value or esthetic appeal, mammals, birds, fishes, reptiles, and even insects have been commemorated on postage stamps. Some of them are highly symbolic of the countries of their origin; many more seem to have been chosen primarily for the decorative appeal and the charm of the wild creatures themselves.

Even casual observations of postage stamps suggest a fuller appraisal of the concept of employing Nature, particularly wildlife, as a central theme in postal issues, both here and abroad. We find that not only does Nature, in one form or another, appear on postage stamps more frequently than might be suspected, but, in recent decades, the idea has been gaining headway throughout the world. The United States, however, has been far outstripped by many lesser nations in this highly appropriate way of paying tribute to forms that have contributed so much in beauty and interest to our wealth and greatness.

The bald eagle, which has appeared on United States postal issues more frequently than any other form of wildlife, has gained that recognition more because it is our national bird than because it is a member of our varied wildlife. It appeared almost at the beginning of Federally issued postage stamps, as the central theme, in the series of 1851, on the one-cent "U.S.P.O. Dispatch" stamp. It was used symbolically on two denominations of the series of 1869, where it appeared atop a shield, grasping an olive branch in its talons. Then came a lapse of years before the national bird again was recognized, this time in 1911 on a ten-cent stamp expressly for registry purposes. This design, showing the bird perched with upraised wings on a pinnacle, was the most realistic thus far produced on U.S. stamps. Thereafter, our national bird has found a place on postage stamps mainly as a decorative feature, or in replicas of the National or State seals. The latest one appeared on the issue of 1946, on which the Honorable Discharge Emblem depicted a conventional eagle. In general, the bald eagle has played a role in U.S. postage somewhat similar to that of the lion, which has run symbolically through many series of stamps of the British Empire and its colonial possessions.

The bison, whose thunderous herds once covered the western plains, was given recognition in the Trans-Mississippi "Omaha" Exposition stamps, issued in 1898. A four-cent orange stamp of that series depicts an In-

dian, hunting from horseback, about to bring down a bison with bow and arrow.

Full recognition, however, was eventually accorded the bison as a "distinguished American" in the issue of 1922-23. In the thirty-cent sepia of that series a splendid bison bull is the central theme of the design. This stamp is the only one in the entire United States series in which a wildlife species, as such, provides the sole motif of the design. And it appeared only after the bison had disappeared as a wild species from the plains of the West. The stamp thereby met the criterion of commemorating an historical event!

The most recent exposition of wildlife on United States postage stamps is that set forth on the three-cent green stamp commemorative of the establishment of the Everglades National Park in Florida in 1947. Against a background formed by a map of Florida is that distinctive member of semi-tropical avifauna, the great white heron.

We have, however, not entirely ignored things naturalistic in our postal issues because a series devoted to our national parks appeared in 1934. Of ten denominations, each devoted to a single park, nearly 390,000,000 regular copies were struck off. Such wholesale recognition of areas set aside for the preservation of Nature in all its forms speaks well of the possibility of breaking through precedent and commemorating wildlife in some future issues of our stamps.

Nations vary greatly with respect to the subjects depicted on their postage stamps. Some extol the political, and their stamps are replete with portraits of rulers or men in public life. Others lay stress on works of commerce and industry. In a more tranquil vein are the spots of scenic beauty pictured on some foreign stamps. Canada has featured the borderline attraction, Niagara Falls, while the Philippines have appropriated one of our own scenic highlights, the Falls of the Yosemite, with which to adorn one of their stamps. Nearer the polar extremes, Iceland in the north, and the Falkland Islands in the south, have been captivated by the frigid charm of an iceberg.

More specific in their recognition of Nature are nations to whom plant life has appealed, either as an economic asset or merely as a thing of beauty. Palm trees are the central theme of stamps of many tropical and semi-tropical countries. Colombia has extolled its orchids. The papaya and the rubber tree, because of their economic significance, have found places on the stamps of Tripolitania and Ceylon, respectively. The giant Kauri tree of New Zealand, the Cedars of Lebanon, and the enormous pads of the Victoria Regia lilies of British Guiana, have been similarly honored on stamps.

At the opposite climatic extreme the edelweiss is commemorated by a stamp of Czechoslovakia, while Switzerland, with its wealth of scenic upland, has chosen plants that adorn its alpine slopes — the alpine primrose, the arctic gentian, aquilegia and lilies.

Animal life has had many representatives in foreign postal issues. These include the silkworm, its cocoon and moth on a stamp of Lebanon; conch shells of the Cayman Islands; the whale found on stamps of the Falkland Islands. Fishes have appeal, both from their economic and recreation values. One would scarcely believe that the carp "rated" a place of distinction on postal issues, yet it may be found on a stamp of China. Both the cod and the salmon are on the stamps of Newfoundland, in recognition, no doubt, of their economic importance to that maritime region. The dolphin of the Cayman Islands, the marlin of New Zealand, and the swordfish of Panama, have their places on postage stamps, partly, at least, from their value as sources of recreation. But the sheer beauty of tropical fish life certainly was the motive that led to the reproduction of "sea gardens" on one of the stamps of the Bahamas.

Among the reptiles the crocodile, which has played important parts in the mythology and history of primitive tropical peoples, is conspicuous in the postal issues of several African colonies and those of Australia. Other lizards are found on the stamps of Liberia, Ecuador, and New Zealand. Sea turtles are pictured on issues of the Cayman Islands, while the aged Galapagos tortoises are the central theme on one of the stamps of Ecuador.

The esthetic as well as the economic importance of birds and mammals have led to their being the most frequent faunal features on the stamps of the world. These two groups of vertebrates are about equally represented, and here, again, colonial lands and the lesser nations have far outstripped the greater powers in giving generous recognition.

Eagles of one type or another, frequently only symbolic, embellish the stamps of many foreign nations. Because of its wide distribution, the golden eagle is dominant throughout these designs, and nations of widely divergent origin and political history have employed it. Our own national bird, the bald eagle, is represented, along with a portrait of Washington, on one of the stamps of Ecuador.

Next in frequency to the eagles is the condor, which appears on the stamps of at least five South American countries. The vulturine lammergeier of Europe is found on one stamp of Liechtenstein.

Lesser birds of prey, the falcons and hawks, are on the stamps of several nations, Liechtenstein figuring

both the peregrine falcon and the buzzard, (Buteo) while Czechoslovakia has used the falcon allegorically. An owl is found on one of the Honduran stamps, and even the turkey vulture, seldom glorified in this country, has been commemorated on a stamp of the Falkland Islands.

The varied bird life of the tropics of both the New and the Old World, as well as that of the nations "down under," has embellished many postal issues. In Africa the ostrich is found on the stamps of Abyssinia, Italian Somaliland, and Tripolitania; the great bustard of southwest Africa; the Kavirondo cranes of Kenya and Uganda; the egret of Liberia; the shearwater of the French Sudan; the marabou storks of the Belgian Congo. In central and South America one finds the Cocoi herons on the stamps of Bolivia; the jacana on those of British Guiana; parrots in French Guiana; the teratero and albatross in Uruguay, and toucans in Bolivia and French Guiana. Best known of all, however, are the stamps of Guatemala, which long have been adorned with that gem of the jungle, the resplendent trogon. Even the isolated Falkland Islands have recognized several of their unique species, including the upland goose, the black-necked swan and the king and gentoo penguins. In the West Indies bird life appears on the stamps of the Bahamas (flamingo), Bermuda (yellow-billed tropic bird) and the Cayman Islands (gannets).

Many odd species are figured on the stamps of Australia and the Oceanic nations. The kookaburra, or laughing jackass, decorates two Australian issues, and the emu and lyrebird, others. In West Australia the black swan appears on several stamps. New Zealand has the pied fantail, the kea and kaka parrots, the flightless kiwi, and the tui, or parson bird. Other Oceanic countries have given recognition to the birds of paradise (New Guinea and Papua), the brush turkey (British Solomon Islands), the cassowary, cockatoo, Argus pheasant and hornbill (North Borneo), the frigate bird (Gilbert and Ellice Islands) and the odd kagu (New Caledonia).

Birds have had a somewhat less appeal on postage stamps of Asiatic nations. Japan, however, has recognized the dove, wild goose, goshawk and the sacred golden kite. China also has figured the wild goose; Manchukuo, the stork; India, pelicans; and Lebanon, a night heron.

Of the European nations The Netherlands have used the crow and the mute swan; Liechtenstein (in addition to the lammergeier) has figured black-headed gulls, swallows and a grouse; Italy and Romania, swallows; and Russia has a decorative version of some sea bird. The humble "dove of peace" has ventured forth on the stamps of Romania and Vatican City. Greenland has featured the king eider; Newfoundland has memorialized the ptarmigan; and Canada has used the Canada goose on one of its airmail stamps.

Just as eagles and condors dominate the avian representatives on postal issues, certain mammals also have had a strong appeal. The large cats typified by the lion, tiger and leopard occur repeatedly on the stamps of many nations. In addition to the symbolical lion on many British colonial stamps, the king of beasts appears in its own right as a fitting subject of postage stamp adornment in many nations not associated with the British Commonwealth. It is on the stamps of Abyssinia, the Belgian Congo, Italian Somaliland, Mozambique, Syria and even on those of Paraguay. In two instances (Belgian Congo and Tripolitania) the king of beasts stepped aside to have its mate, the lioness, embellish the stamp. The vanishing Gir lion, represented in 1936 by a scant 200 individuals in the State of Junagarh in western India, appears on stamps of Soruth.

That fearsome predator of the Asiatic jungle, the tiger, has been recognized on the stamps of India and one of the Straits Settlements (Panang). Its spotted and scarcely less feared relative, the leopard, adorns the stamps of seven African countries. It also appears on one of the issues of North Borneo in Occanica. As

far as I can ascertain, the related American jaguar is found only on a Bolivian stamp. The golden cat, a feline whose range extends to the eastern Himalayas and western China, Sumatra, and Borneo, is pictured on a stamp of Liberia, and the swiftest of all four-footed creatures, the cheetah, appears on a stamp of Italian Somaliland.

Next to the big cats, the elephants (Asiatic and African) have had the greatest appeal to designers of postage stamps. Although the former of these has long been a domesticated beast, it still persists in the wild, as does its African relative. The enormous size of these great pachyderms, as well as the regal splendor associated with the Asiatic form, no doubt have earned the rightful place they hold on the stamps of numerous countries. The Asiatic form is found on the stamps of Ceylon, Burma, Straits Settlements and North Borneo; and the African on those of at least eight countries of the Dark Continent.

If taken as a group the varied ruminants probably exceed both the big cats and the elephants as postal themes throughout the world. Throughout Africa the several forms of antelopes, gazelles, buffaloes, giraffes and other ruminants have been conspicuous on postage stamps for many years and in many countries. There they constitute an important meat supply of native peoples. "Screw-horned" antelopes, of which there are several, appear on the stamps of at least four African countries. Liberia figures the bongo, zebra and royal antelope, the latter being the smallest of all ruminants, standing only ten inches high at the shoulder. Antelopes also are found on the stamps of Abyssinia, Italian East Africa, Tripolitania and even on one stamp of India. One of the largest of the antelopes, the eland, is employed on a stamp of Southwest Africa, and the wildebeest or gnu, on those of Southwest Africa and Uganda. Giraffes are central themes in the stamps of Abyssinia, Mozambique Company and Nyassa.

Other hoofed animals figured on postage stamps include the dimunitive white-shouldered duiker and the water chevrotain in Liberia; gazelles in Eritrea, French Morocco, Togo and Tripolitania; the springbok, renowned for its jumping ability, in Uganda; and the water buffalo in Abyssinia, Liberia, and Belgian East Africa. The unique okapi, related to the giraffe and discovered in the Belgian Congo in 1900, is figured on a stamp of that country. Camels, now beasts of burden in the desert, are represented on the stamps of several African nations, and the banteng, or wild ox, on those of North Borneo.

In Bolivia and Peru llamas, New World camel-like animals, now domesticated, adorn postage stamps, while in Bolivia the related vicuna, living at high Andean altitudes, also, is figured.

Elsewhere in the world one finds the caribou commemorated in the stamps of Newfoundland; the chamois in those of Czechoslovakia and Liechtenstein; a mountain goat in Tannu Tava in northern Mongolia; the reindeer (now domesticated) in Norway and Russia; the stag (the male of the red deer) in Liechtenstein and Wurttemberg and the Sambur stag in distant New Caledonia.

A variety of other wild mammals is set forth on stamps throughout the world. Conspicuous among these are the primates — the chimpanzee in the Belgian Congo and Liberia and the orangutan on several issues in North Borneo. The grotesque proboscis monkey (North Borneo) and the bay-thighed Diana monkey (Liberia) also are found on stamps. Elsewhere in the tropics one encounters both the large and pygmy hippopotamuses on the stamps of Liberia, while the larger form also appears on those of Italian Somaliland and the Mozambique Company. The equally ponderous but more dangerous rhinoceros is illustrated on the stamps of North Borneo, French Equatorial Africa and the Mozambique Company. The two-horned rhino appears on a stamp of Abyssinia.

Three of the world's oddest mammals are represented on the stamps of Australia, the kangaroo, the koala, that queer tailless marsupial that looks so much like a "Teddy-bear" and feeds on the foliage of eucalyptus, and that enigma, the duck-billed platypus, a mammal that lays eggs. North Borneo and French Guiana submit the Malay tapir, and North Borneo also offers the bruang, or sun bear, and the wild boar. Wild horses are represented on the stamps of Mongolia and the ornamented equine of Africa, the zebra, is set forth on the stamps of four African countries.

At the other extremes of the world one also finds recognition given to those mammals that play so important a part in the economy and survival of the people. Both Greenland and Russia have honored the polar bear on postage stamps. The seal is similarly recognized in Greenland and Newfoundland. It remained, however, for the isolated Falkland Islands, to commemorate the largest of the mammals, the whale. To Bolivia goes the distinction of depicting a mammal from its high Andes, the chinchilla, a rodent quite rare if not extinct in the wild, but now domesticated and raised for its delicate fur.

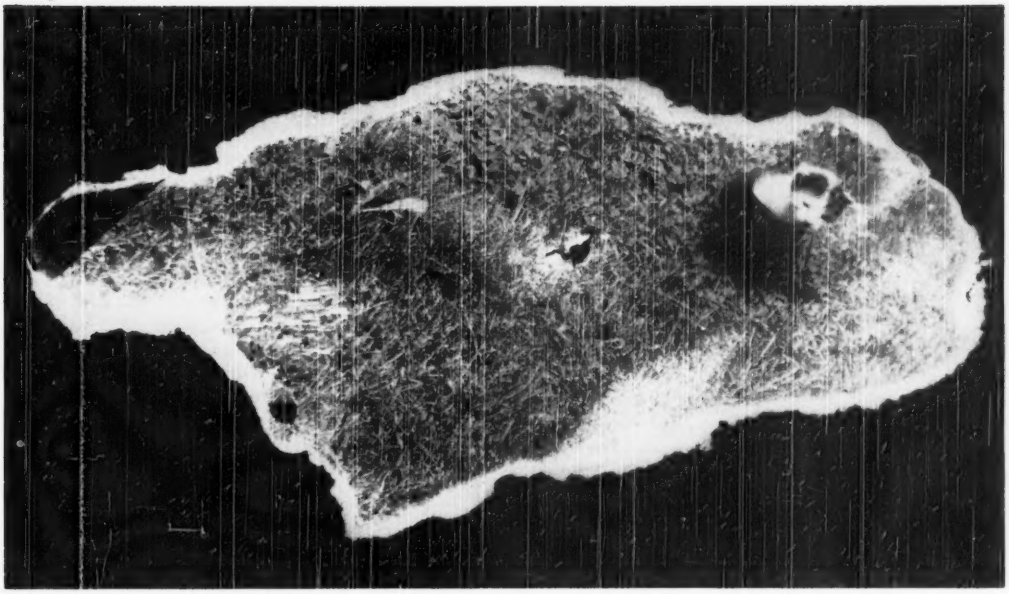
The history of wildlife as a theme of design in postal issues is significant. The bald eagle appeared symbolically on stamps of the United States as early as 1851. Other nations gave similar recognition of wildlife thereafter. Japan figured the goose as early as 1875, and in the following decade at least seven postal issues figuring wildlife appeared throughout (Continued on page 332)

Reminder

By RUTH SEYMOUR VESELY

I see a robin standing like a statue,
Alerted for the subterranean worm.
A sudden forward thrust, and now his victim
Is gobbled up without a chance to squirm.

That dignified and somewhat pompous manner,
The tilted head and sharp eye looking down,
And then the swift attack. . . *Why am I thinking*
Of Judge Josiah Jones in my home town?



This fragment of film recovered in an arson case investigation, when printed, revealed a picture of a kitten in a shoe and led eventually to the solution of the mystery of an apartment house fire.

Animals Help the F. B. I.

By FRANK A. WOODFIELD

ANIMALS are proving their value in helping criminal investigators to "break" some of their toughest cases. Bloodhounds long have been recognized as helpful to peace officers, but a study of the records of the Federal Bureau of Investigation shows that other kinds of dogs, and horses and mules, cats, and, in one case at least, a wild moose has had a key part in aiding justice.

In one instance it was a little kitten that led to the solution of the origin of an apartment house fire.

While all FBI agents may not have to be biologists or naturalists, in addition to all else they must be, it is quite evident that Director J. Edgar Hoover encourages his men to be ever alert for any unusual animal indications. One can never know when he will be assisted in his task by the bark of a dog, the mew of a cat, or the neigh of a horse.

The case in which a wild moose helped the F.B.I. occurred in Alaska during World War II. The agents were trying to locate a Selective Service violator who was known to be hiding in an area considered almost inaccessible.

F.B.I. agents, utilizing a ski-plane, finally located the fugitive, who immediately started to flee across wastes covered with ice and snow. For three days the agents, using the ski-plane and snowshoes, kept on the trail. The plane made twenty-seven landings, many on hazardous snow fields.

Some of these landings were made near spots where the fugitive had been seen, but he always managed to conceal himself by taking to forested areas before his pursuers could reach him.

The fugitive traveled on snowshoes and carried a ninety-pound pack on his back as well as a rifle and ammunition. Frequently he traveled across windy stretches of country where there was a chance the drifting snow would obscure his tracks. Sometimes he took off his snowshoes and made his way along bare ridges, hoping to conceal his trail and lose the persistent agents. All in all during his flight he covered about fifty miles, and once crossed a mountain peak 1500 feet high.

During their pursuit the special agents of the F.B.I. observed that wild moose in the area always knew when the fugitive was nearby. They noticed that the moose, fearful of their traditional enemy, always looked toward him. In that manner the moose helped the officers to spot the fleeing man.

On the evening of the third day of the chase the agents caught the fugitive curled up in his sleeping bag for the night. He was thoroughly exhausted and admitted that he had just about given up hope that he would be able to elude the searching party.

In a southern State a mule provided the answer to an investigation. A man pilfered a number of articles from a home and then nonchalantly rode away on a mule, which he had stolen near by. Someone spotted an individual, who looked like the thief, riding a mule along the railroad tracks. Later the stolen mule was recovered, after it had been abandoned. A short time later the thief was picked up as a suspect by investigating local officers.

His trousers, together with a sample of hair from the side of the mule, were submitted to the F.B.I. laboratory. Hair bearing characteristics of the equine family was found on his trousers and in his trouser cuffs. A comparison of this hair under the microscope with the hair from the side of the stolen mule reflected that the two specimens strongly resembled each other.

A telegram was sent from the laboratory to the police pointing out this similarity. When this telegram was read to the suspect he pleaded guilty to all charges.

Dogs rank high, of course, as big helpers of peace officers. In a western State the barking of a dog attracted attention to the body of a woman who had been brutally murdered. The dog, a small, white, fox terrier with one black eye and one black ear, kept barking during a constant vigil. Law enforcement officers were able, through the tag around the animal's neck, to identify the murdered woman and solve the case.

Use of bloodhounds on many occasions has directly and quickly solved cases that otherwise might have taken many more days and much extra work to solve by other means. They have been useful, too, in locating not only criminals or suspects, but other missing persons, lost in vast deserts or in heavy mountain thickets.

In one instance three small boys were found by bloodhounds. The children, aged 7, 8 and 10 years, had failed to return home from playing in the nearby river bottom. The dogs were put on their trail at 10:30 P.M. At 6:30 o'clock the following morning, after following a devious route of about twenty miles the animals led the searchers to the children, who were huddled together and so frightened they could not talk.

One child was barefooted. Much of the ground that had been covered was so overgrown with thickets that the officers had to crawl. Undergrowth was so heavy in places that there was space of barely six inches between the growth and the ground. There was evidence that at several places the children had barely missed falling into the river in the darkness.

On another occasion bloodhounds speedily solved the mystery of the burglary of a suburban schoolhouse. They followed a trail down a road, across an irrigation lateral and through a field to a home where a young boy — still in bed when the officers arrived — denied he had been at the schoolhouse the preceding night. When he was shown the dogs and learned that they had trailed him from the schoolhouse he quickly confessed.

In the case in which the kitten "took credit" for helping law-enforcement officers, F.B.I. technicians in the laboratory were examining some incendiary materials recovered from a fire in an arson case. One item, at first unrecognizable, turned out to be a fragment of developed camera film on which there was the picture of a kitten sitting in a shoe. The police traced the kitten-in-the-shoe picture to the home of a fifteen-year-old boy, who confessed he had set an apartment house on fire while trying to make a stink bomb.

With these and other instances at hand it may be understood why encouragement is given peace officers to have a knowledge and understanding of animals, and to be ever alert to clues that these "friends of man" may furnish.

Caught in the Act

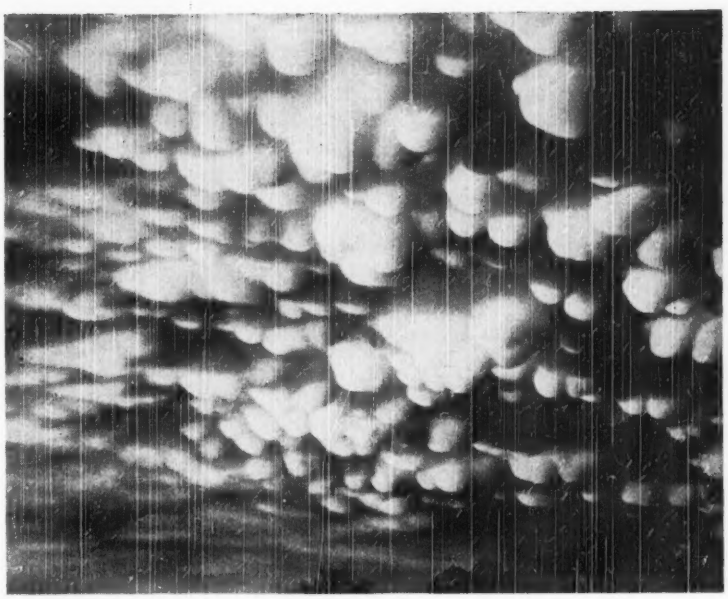
By JOSEPH R. SWAIN

Photograph by the Author

Both parent bobolinks were busily feeding their babies in the nest in a Connecticut field. From a blind I was recording the event, when, suddenly, the behavior of the parents changed, and they flew back and forth with alarm notes sounding. Then the head of the black racer appeared at the nest. My first impulse was to interfere, but first I snapped the picture, and then dashed to catch the snake, which readily gave up the baby bird, uninjured. And I let the racer go, for snakes have to eat, too, and play their part in maintaining Nature's balance. The parent birds, although violently protesting, made no physical attempt to dissuade the invader by personal attack.

Cumulus Mammatus

By ERNEST ROBSON



CLOUDS, usually, are taken as a matter of course. We may look at them and say, "It looks like rain." Sometimes, however, clouds inspire wonder — even fear. The clouds shown here caused neighbors to call one another on the telephone to ask, "Have you seen the strange clouds?" Speculation ran rather wild as to their cause. Tornado was mentioned: even atom bombs. Tornado was not far wrong.

Rare as they may be such clouds are known and named by meteorologists. *Cumulus mammatus* they call them. The "mammatus" comes from the "breast-like" appearance. They do not necessarily mean "tornado" but are customarily associated with a disturbance of some sort. Fliers consider them to indicate "extreme turbulence." This disturbance, however, is usually not in the immediate vicinity of these "upside down" clouds.

The formation pictured appeared toward an August evening in Stark County, Illinois. Although there had been high, southwest winds during the afternoon, it was relatively quiet when the clouds appeared. A sunset yellow added to their strangeness and to their beauty. The clouds were seen over perhaps a thirty-mile area. Later investigation located the disturbance about fifty miles to the west. Near the city of Alexis, Illinois, two tornadoes — a double twister — did nearly a million dollars worth of damage. To the northwest hail fell, the size of baseballs. The people in the area of the storm's violence did not see this unusual cloud formation, which was at the edge of the storm. In the area where they were seen, however, they were a major attraction; a "once-in-a-lifetime sight."

★

Nature's Television

By MAURINE M. WAGNER

Look up! The clouds are passing by!
A pan-or-am-ic pictured sky
An ever-changing shifting view
Is there in fragmentary blue.

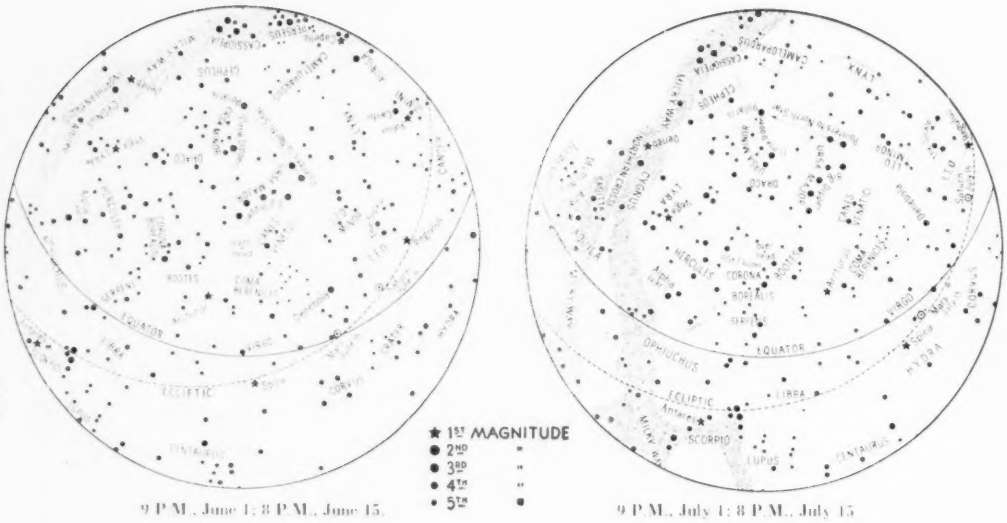
Sunrise! Sunset! and in between,
The technicolor's on the scene.
To make your doubtful spirit bright
God sets His rainbow all alight!

The cirrus, stratus, nimbus bold
And even cumulus unfold.
Cloud curtains part — the lightning darts.
Shadows come and the sun departs.

The sound effects shall never fail
As long as thunder rides the gale.
Though hail does cut and wind does blow
There comes the silence of the snow.

And if you tire of daytime's hue,
The night comes on without a cue.
The moon shines bright — the stars give light.
Both for your spirit's sheer delight.

Look up with me and you will see
God's never-ending mystery
Though time and tide may pass you by
There's still a pageant in the sky.



9 P.M., June 1; 8 P.M., June 15.

9 P.M., July 1; 8 P.M., July 15

To use these maps hold them before you in a vertical position and turn until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south. Times given are Eastern Standard.

The Heavens in June and July

By ISABEL M. LEWIS

Two of the most interesting constellations in our summer skies, Scorpio and Sagittarius, will soon be photographed extensively by a group of astronomers who have recently departed for South Africa, especially for this purpose. Professor Bart J. Bok, associate director of the Harvard College Observatory, who has carried on extensive studies of our Galaxy, heads the Harvard group of three astronomers. They will join a group of astronomers from the observatories of Armagh, in Northern Ireland, and Dunsink, in Eire. The station to be occupied by these astronomers is located at Bloemfontein, in the Orange Free State, South Africa, and is the Boyden Station of the Harvard Observatory, of which Dr. J. S. Paraskevopoulos is the resident superintendent.

A new telescope has been specially constructed for this expedition, and when it has been set up at the Bloemfontein Station will bear the initials ADH. These stand for the three observatories — Armagh, Dunsink and Harvard — that have cooperated in the building of it. This telescope is known as a Baker-Schmidt telescope. It was designed by James C. Baker, Research Associate of the Harvard College Observatory. It has two mirrors, a correcting lens with a free aperture of 32 inches, and a focal length of 120 inches. It will cover an area nearly equal to 100 times that covered by the full moon. It was constructed by the Perkin-Elmer Corporation in Glenbrook, Connecticut, where also was constructed a 33-inch objective prism, which is the world's largest prism. This will be used in connection with the new telescope for photographing the spectra of the stars in this region of the Galaxy.

Although the ADH telescope will be used jointly by observers from the three observatories, different projects will be undertaken. It is the plan of the Harvard expedition to gather information photographically and spectroscopically concerning the central region of the Galaxy lying within the Scorpio-Sagittarius region. Another object of the expedition will be to attempt to find clues to the origin of stars in the cosmic dust and dark and luminous gaseous nebulas that abound in the vast star clouds of the Milky Way in this part of the heavens.

At the Boyden Station in Bloemfontein, which is 30 degrees south of the equator, Scorpio and Sagittarius pass through the zenith and are most favorably placed for observation. In the northern hemisphere, in latitude about 40 degrees north, they lie so close to the southern horizon — some of the most brilliant regions within less than 10 degrees of it — that it would be futile to attempt any detailed investigation of this region in our latitudes. It is quite usual for northern

observatories to set up southern stations, either temporarily or permanently, for the study of certain stellar regions that cannot be reached from northern latitudes. This was also done at the last close approach of Mars in 1941, when it was far south of the equator. It was then poorly placed for observation at the Lowell Observatory at Flagstaff, Arizona, and an observer from that observatory spent some time in South Africa photographing and studying the surface of the planet at that time.

It is the purpose of the present expedition "to undertake a complete census of the stellar population in the central region of the Milky Way," according to Dr. Bok. It is expected that the Harvard group will return from South Africa in the fall of 1951. Its work will consist chiefly in the collection of photographic plates of this region with the new telescope, and spectrograms with the aid of the 33-inch prism, as well as measurements of the brightness and colors of stars. This represents only the first step in a five-year project. Upon the return of the group to the Harvard Observatory, a study of the thousands of photographs that will have been obtained will be begun by specialists in several different fields of astronomy.

The Milky Way, or Galaxy, is a vast aggregation of stars, bright and dark nebulas, and clouds of interstellar cosmic dust, extending as an irregular belt completely around the heavens. Our sun is only one unit in this vast system, which is in revolution about its center in Sagittarius. Numerous dark or faintly luminous regions are projected against dense, brilliant clouds of stars in the Galaxy in the form of dark holes, streaks or bars. A dark rift in the Galaxy between Cygnus and the Scorpio-Sagittarius region appears to separate the Galaxy there into two branches, and is the greatest of all these strangely dark regions. It extends nearly one-third of the entire length of the Galaxy.

This galactic system, to which our own sun belongs, is greatly flattened, or lens-shaped. Its extent along its greatest diameter has been estimated to be as great as 300,000 light years, although this is now considered to be too great an estimate. Its depth is now considered 10,000 light years. Our own sun lies not far above the central plane at a distance of about 30,000 light years from the center in Sagittarius. There is also a bulge in this central region that may be compared to similar central bulges in some great spiral nebulas, millions of light years from the earth, that appear to be similar systems.

It is from the central region of the Galaxy that cosmic noises have been intercepted by means of the new radio telescopes. Similar radiations come from the sun and from other regions in the Galaxy, in particular in Cygnus. The cause of these cosmic radiations, or noises as they are generally called, has not yet been explained satisfactorily.

The constellation of Scorpio appears in the southeastern sky on June evenings. It lies across the meridian at nine P.M. early in July. It is one of the most brilliant constellations in the heavens. Its long tail of brilliant stars extends below the southern horizon in our higher northern latitudes, and it is never seen there to advantage. It has, in addition to the brilliant red super-giant star, Antares, which has a diameter of 400,000,000 miles, five stars of the second magnitude, and nine of the third magnitude. One of the mythological tales told about this interesting constellation was that the giant warrior, Orion, so feared the Scorpion that he disappeared in the west when the Scorpion appeared in the east. Sagittarius crosses the meridian about six weeks later than Scorpio. It contains no stars of first magnitude, but two of second magnitude and seven of third magnitude. A conspicuous configuration by which it is easily identified is the little inverted dipper outlined by second and third magnitude stars. It is of special interest because the center of the whole galactic system is located among its brilliant star clouds. One of the most brilliant portions of the Milky Way is that located in Sagittarius.

Wood Pewee

By SUE WYATT-SEMPLE

The warbler wave is past,
Another spring is gone;
Why cannot beauty last
For eyes to feast upon?

A plaintive note is heard—
The answer comes to me:
A drabbish little bird
Says sadly, "Pe-ah-wee!"

Virgo, with its brilliant blue-white Spica making a huge triangle with Denebola in Leo and Arcturus in Bootes, is conspicuous at this time of year. It is a large, straggling constellation with its conspicuous Y lying across the celestial equator. Spica is a brilliant white, giant star at a distance of about 180 light years from the earth.

Orange-hued Arcturus in the kite-shaped constellation of Bootes will be prominently in view throughout the summer months. It is one of the nearest stars, at a distance of about 32 light years from the earth. Although so different in color from brilliant, diamond-like Vega, now visible in the northeastern sky, it is almost exactly equal to it in brightness. The distance of Vega from the earth is about 23 light years.

Among the planets during these two months we will find that Mercury will not be in the evening sky until after superior conjunction with the sun on July 10, and then will be very poorly placed for observation for the remainder of the month. It will be in the morning sky all of June and until July 10, and at greatest western elongation on June 10. This is not a favorable elongation, and on that date, when it should be best seen, it will be only 10 degrees above the eastern horison at sunrise.

Venus will remain conspicuously visible in the eastern morning sky during June and July. Although it outshines all stars and planets as usual, it is decreasing in brightness and will be seen (continued on page 332)

Camera Trails

By
EDNA HOFFMAN EVANS

"O suns and skies and clouds of June
And flowers of June together . . ."

OF COURSE the poet went on to explain that she was not talking about June at all, but was praising "October's bright blue weather." Just the same, it has always seemed to me that she gave June a pretty good plug, and for that reason I think the lines are appropriate for a June "Camera Trails" section.

June, with its suns and skies and clouds, is one of my favorite months. October, on the other hand, may be bright and blue, but there is a bite in the air and more than a hint of colder weather to come. June is a forward-looking month. There is summer ahead, and vacation days with places to go and new things to see. October's arrival means that vacation is over and it is time to settle down to work for another nine months, until June rolls around with its forward-looking prospects again.

Summer days and vacation trips mean (I hope) new photographic opportunities — trees, flowers, animals, birds, beaches, mountains, lakes with sun on the water, blue skies, and soft white summery clouds. There are picture possibilities in those sunny skies and in those clouds, be they the heavy cumulus that pile up and up into billowy towers before they mushroom out and melt into thundershowers, or the graceful, feathery wisps of mares' tails streaming across the sky to tell of windy weather either coming or gone. How can we best capture those skies and clouds on film?

This cloud picture was shot directly into the sun so the clouds are backlighted and "silver-lined."

Unless the photographer takes considerable pains to get them, those summer clouds are mighty elusive camera subjects. They seldom show up as clearly as they should in the background of landscape, or other scenic shots — they do not, that is, unless some special device is used to capture them. In most cases stopping the lens down is not sufficient. What is the answer then? Why, filters, of course.

Filters can and should be used for either black-and-white or color film. Let us consider those for black-and-white film first. The term "cloud filter" is a rather inclusive one for it can mean any filter that will darken the sky in order to make the clouds stand out light in contrast. A "sky filter," on the other hand, is a more specialized and less commonly used gadget, the top half of which contains a dye that will hold back the light from the sky and make it appear dark in the finished picture so white clouds will show against it.

Yellow, orange, and red filters are used most frequently in cloud picture-taking. The color and the range of density within a single color depend on the amount of emphasis the photographer wishes to give his sky and the clouds therein.

Yellow filters tend to correct color values, rather than to emphasize any one feature. Orthochromatic and panchromatic films are oversensitive to blue and violet light so the yellow filters cut down on the amount of this light that can pass through the lens, and, at the same time, they permit other colors to register without so much blue-violet competition.

Orange and red filters overcorrect color values; they increase the contrast in landscapes, deepen the shadows, and make a blue sky appear dark. Light objects and clouds stand out sharply against these over-darkened backgrounds. The darker the filter, the more spectacular and dramatic the contrast obtained.

This three-color filter discussion attempts to simplify a rather complicated subject. Actually, there are dozens of filters and they are designated by a variety of names, numbers, and letters. It sounds impressive to rattle off filter designations — innocent bystanders will think you know a tremendous amount about photography. However, the terms "light," "medium," or "dark" will do just as well, for it is the result and not the name of the filter used that is important.

Actually, the photographer needs only a few of the numerous filters that are

The Mexican yucca trio silhouetted against a rain cloud background also tell a weather story.

available. A yellow one will correct color values in landscapes without overemphasizing any particular feature. An orange one will give moderate contrasts, while a deep red one will show clear white clouds against a dramatically black sky.

There are some "dos" and "do nots" to be remembered in connection with the use of filters. A red filter should not be used with orthochromatic (verichrome) film, for that film is not sensitive to red light. Yellow and orange filters, however, can be used. Filters of all colors can be used with panchromatic film.

Filters, of course, cut down the amount of light that passes through the lens and reaches the film. For this reason the exposure must be lengthened when a filter is used. It is in this realm that a knowledge of filter designation is rather important, for a filter may increase the exposure necessary from one and a half to eight times. This lengthening of exposure is known as the "filter factor," and a picture made with a filter having a 4x factor requires four times the exposure it would if the filter were not used. Always include the filter factor in your calculations; otherwise the result is an underexposed negative that completely destroys the very effect you were striving to gain.

For color film there is an entirely different set of filters to be had, and again the choice of filter depends on the type of film being used and the effect the photographer is striving to obtain. I would recommend that readers interested in this particular phase—color film and filters—write to the Eastman Kodak Company for the recently issued leaflet, "Filter Data for Kodak Color Films." Punched to fit the Kodak photographic notebook, this leaflet includes a discussion of the color quality of light sources, and gives technical information, as well as charts, on the care, cleaning, and storage of the filters it discusses. The leaflet may be obtained free of charge from the Sales Service Division, Eastman Kodak Company, Rochester 4, New York.

The foregoing all sounds very well, but what happens at those times when clouds do not show up as they should in the finished picture? A misty sky does not photograph as dark as a clear sky, while an overcast sky is darkened very little by any kind of a filter. The difference of color intensity in various portions of the sky also makes a difference in the filtered result. The sky near the horizon frequently is lighter than it is overhead, thus the filter has little effect on sky value close to the horizon. The same holds true for the sky close to the sun — there, too, it is brighter and less blue than in other portions of the sky.

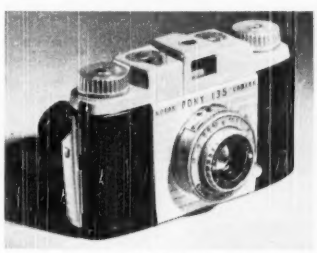
There is another way to emphasize clouds, even when no filter is used. This comes in the printing process when sky areas have been overexposed in contrast to the land values under them. The entire picture can be given the correct exposure for the foreground and then the foreground can be covered while the sky and the clouds are "burned in" by giving them a longer period of exposure. Underexposed clouds usually present a rather hopeless problem and there is little that can be done about them.

And then there are those times when the sky is blue and cloudless, when there is not a speck, nor a wisp, nor even a puff of cloud in the sky. Can the photographer manufacture clouds as modern day rainmakers claim they can produce rain? Yes, the photographer can, but in quite a different way. And I am not sure that it is an honest way, or a way to be recommended for Nature photographers who, presumably, are interested in recording Nature "as-is." This process is called "double printing," and in it one negative is used for the foreground while another, containing the desired cloud effects, is used for the sky. The process is not as simple as it sounds, but it sometimes solves the cloud problem.

The next questions are — should clouds serve merely as backgrounds, or can they make up the whole picture? I answer definitely and unhesitatingly yes to the latter; clouds do have excellent picture possibilities in and of themselves.

Note the picture shot directly into the sun, so that the clouds are backlighted and "silver lined." Pictures of that kind are effective and they need no earthly or foreground material to help them tell their story. Or, for a simple story-telling foreground, note the Mexican yucca trio silhouetted against the rain cloud. Then there are other aspects of weather that clouds reveal — big anvil-topped thunderheads that show rough weather approaching, or wispy mares' tails, cirro-cumulus, and haze that show what happens in the sky after a storm has passed.

And so, without returning to poetry for a fitting close — may the June days and the summer ones that follow, bring plenty of interesting photographic subjects, along with sunny skies and lots of well-behaved clouds whenever you want them.



The new Kodak Pony 135

MISCELLANEOUS ITEMS

Almanac Films, Inc., a new company for the distribution of educational and informational films, is located at 516 Fifth Avenue, New York 18, N. Y. The company already has a list of 16mm films and subjects range from insects to solar eclipses. Further information as to exact

(Continued on page 329)

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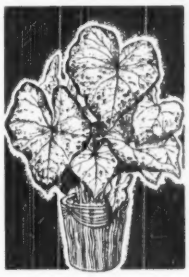

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The School Page

By E. LAURENCE PALMER

Professor of Nature and Science Education, Cornell University, and Director of Nature Education, The American Nature Association

SPIT 'ND POLISH

Most of us who have visited large cities have seen streetside vendors polishing apples with dirty coat-sleeves after surreptitiously having applied an ever-ready liquid as a basis for results. There are sanitary laws against this practice, and perhaps we should be on guard to be sure that polish, which is appealing on the surface, is really more than veneer.

In this article, I am deliberately choosing my text, on a fifty-fifty basis, from New Zealand and the South Seas and from the United States, since I have spent approximately that proportion of my time during the past year in these areas. With equal deliberation, I am avoiding the allocation of the examples in either area, although it is possible you may be able to do that yourself. Besides this, I am dividing the examples from each area into equal parts, so that good and bad cases are matched. Furthermore, I am choosing my examples from the elementary school to the college level, and from urban to rural areas in widely separated parts of the two regions. It is my conviction that the conclusions drawn from these experiences are broadly based, and have an equally wide valid application.

I know of a high school, with a building no more than five years old, equipped with the latest gadgets for teaching army fliers how to solve the electrical ills of an airplane. I was ushered from room to room in this school with clock-like precision, but, in spite of this, I stopped and asked students and teachers who were working on electricity if they could make an electro-magnet for me with some nails, bell-wire and dry cells. Faculty and students had never heard of such a thing; besides they had no dry cells or bell-wire. The equipment being used was locked in great cases when it was not in use, and I felt that other doors to learning were locked against the students who wanted to explore a most valuable area of Nature. In spite of this, my mouth still waters at that equipment, but I am sure that basically it was like the polish on a street vendor's apple, so far as good teaching was concerned.

I visited another school where the teacher had for years been accumulating broken-down electrical equipment. This was used by students and teachers to construct equipment that would work. There was no spit 'nd polish here, but I think I would match the results with the students against those in the lavishly equipped school.

I went into a garden with a teacher and his students. He helped them prune some currant bushes. Every youngster pruned a bush, some doing well and others rather poorly. Unexpectedly, the larvae of some cane-borers were discovered by first one and then another member of the class. With the help of the teacher, who needed a shave and a shoe-shine but little advice in knowing how to help children, the class as a whole demonstrated a surprising understanding of the differences in the larvae of the major groups of insects. I visited another school, elaborately equipped with visual aids, with charts showing pictures of a great variety of insects in most stages of their existence. These substitutes for the real thing were presented to the students on a fixed schedule set in advance by someone other than the teacher. No one got his fingers soiled, or needed a shoe-shine after the instruction was over with. I wonder which offered the better teaching situation?

I saw Greer Garson in "Mrs. Miniver" and felt that she must be able to interpret life most successfully. Then, I saw her in her interpretation of Madame Curie and still remember with horror that shot of her highly manicured fingers as they held certain samples before her for examination, supposedly in an old and heatless shed. I wondered what the Curie lady's hand really must have looked like. Immaculate spit 'nd polish may be fundamental in the equipment used in many branches of science at times, but I wonder if it is always as evident as the movie directors think it is.

I visited a school where the principal's handkerchief stuck cockily from his coat pocket, a fine ring graced his hands, and his glass topped desk was as free of any cover as was the top of his head. Together, we walked across his campus and came upon a small, fat youngster moving slowly and tardily to his class. The principal hailed the culprit to our august presence, and informed me that the child's mind moved as fast as his body and that he was more or less a disgrace to the school. I looked at the well-equipped school, the well-dressed teacher and the child, who obviously had an inferiority complex and did not wonder where I would pin the medal of disgrace.

I visited another school where the principal wore his gown while we visited a first grade room. While I went across the decidedly inferiorly equipped room to watch the regular teacher carry on her work, the principal got down on his knees on the floor in his gown and helped a little child who was having difficulty in understanding the significance of numbers. True the man wore a gown, but there was little of the spit 'nd polish of so many of our more highly financed schools, and a whole lot of real education going on in that school, from the principal down to the first grade teacher.

I know a school where the science teacher is the bus driver for the school. (I did not say the bus driver was the science teacher.) The teacher raised funds with student help to buy some land for the school. On this land, which the students visited with the help of the bus driven by the science teacher, the students built a dam and made a pond. To this they attracted ducks by wise plantings, and around the pond they planted trees that they had grown from seeds they collected, and which they protected from possible fire by fire lanes they themselves constructed. In Fiji, I saw a forestry school built by high school Fijians surrounded by plantations managed by high school Fijians. They were solving, or working towards the solution of a problem that may yield substantial returns to the country when the time comes that it does not have to import shipping cases, material for which can be grown more rapidly locally. I wonder how that school, wholly devoid of spit 'nd polish, would really measure up educationally against some where those in charge would not think of even trying to teach under the trying conditions these people are overcoming with great enthusiasm, and, of course, with a little wise and understanding leadership.

On invitation, I visited an imposing edifice, known as a school, equipped with the finest of physical gadgets and known internationally for its contribution to an important educational activity. During the hour, the teacher spent much of the time talking to one of the better-looking girl students (and I agreed with his choice), but while this was going on some of the youths, who probably after class were the girl's boy friends, put in their time "shooting craps" in a remote corner of the laboratory. As the class filed out, I heard one youth give a valid evaluation of that hour's work by asking a companion how much he won that day. I wondered about the value of the reputation of that school, and of the taxpayers' money that built that school and hired that teacher. Particularly did I wonder about it when I came unexpectedly on some Fijian boys working on their own in that forestry school built by the boys themselves.

I know a teacher in one of the schools I have observed who was forever complaining about the meager equipment available to him, and overlooking completely the superior students with whom he had to work. He changed to a school where he does not dare set a wet dish down on a table for fear of marring the surface, and now is distressed over the quality of students with which he has to work. I wonder where, if ever, he will find happiness, and wish in every way I could help him get a true appreciation of spit 'nd polish.

I visited one teacher training institution where the head

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science teacher was always immaculately dressed, had a good sound knowledge of field natural history, was tremendously interested in good music, but in his class work felt that he always had to aim way above what I am sure was the ability of his students to get a true appreciation of things. He said he knew "all about plant growth and morphology," but he did not know the morphology of the reproductive units planted in corn and beans, or how grass plants increase in length, or many other simple things. I could not help but wonder if he did not have a bit too much intellectual spit 'nd polish, and I wondered really about his influence on his students when I watched him knitting socks through a two-hour teacher-training session. I could forgive him his ignorance of specifics but not his high and mighty idea that the way to teach was deliberately to shoot over the heads of his students, and, I am sure, over his own head. Of course, by that technique he hurts few people, presumably, but neither does he ever hit the mark.

I could go on at length on this theme, choosing examples from almost any part of the world that I have visited, but I think I have gone far enough. Sure, we need spit 'nd polish. But let's not assume that in the teaching field merit can be judged by polish alone, and once in a while, just for our own satisfaction, let us scrape the surface now and then to see what lies beneath.

CAMERA TRAILS

(Continued from page 327)

titles and costs may be obtained direct from the company.

In addition to the new, free pamphlet about color filters, Eastman also has a revised and up-to-date edition of the data booklet, "Developing, Printing, and Enlarging." Like others in the series, this booklet contains a lot of usable information. This one is of particular interest to photography hobbyists who have their own darkrooms. The booklet sells for twenty-five cents.

And as the final Eastman item, the Kodak Pony 828 now has a 35 mm brother, the Kodak 135. The latter is quite similar to the former, with the exception of the smaller film size. The Pony 135 is priced at $34.75, tax included.

Conservation Workshop

Federal, State, and private agencies, and school people in various educational fields are cooperating in the Fresno State College Conservation-Natural Resource Use Workshop this year. Sessions will be held from July 31 to August 18, offering a wide variety of experiences. Participants do not "stay put" but travel to a variety of places to become personally acquainted with conservation and resource use from widely different angles. Full details are available from Dr. Leo F. Hadsall, Fresno State College, Fresno 4, California.

MEN AND STARS

"If the stars should appear one night in a thousand years, how would men believe and adore; and preserve for many generations the remembrance of the city of God which had been shown! But every night come out these envoys of beauty, and light the universe with their admonishing smile."

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SEEING SOIL CONSERVATION

By PREVO WHITAKER

"Poor land makes poor people," said Hugh H. Bennett, Chief of the U. S. Soil Conservation Service. "Poor people make poor land," the other half of the axiom is supplied in the much-used film, *The River*, by Pare Lorentz.

In lands where, century after century, mankind has multiplied, the axiom is illustrated; the earth has been called upon to give a little more of its minerals and substance, give all it has, and get nothing in return. We read of wornout soil of Europe, of intensive cropping, and of almost frantic efforts to make it do just once more. We read how human waste is used to fertilize the soil in certain countries, and how every stick and straw produced is saved. And we pick up our morning newspaper to see in the headlines how the heavy floods have washed away houses, livestock, and crops in Ohio; how ten million tons of soil were swept down the rivers and streams in Indiana; and how sunbaked Kansas soil was cleaned off the streets of New York following the most terrific dust storm in history!

As the settlers of this country scuffed back the thick leaf mould and stirred the rich floor of the virgin forests, they must have been awed by the apparent endlessness of it. They knelt and gave thanks for the first crops raised; they instituted Thanksgiving Day because the richness of the soil gave them so much abundance. We still observe Thanksgiving as a holiday, but we are forced to wonder how much actual tribute we pay the Creator as we see the reckless waste of our natural resources.

Our forefathers struck into this abundance. They cleared the forests, they sowed and reaped, they drained swamps and lakes, and they moved on to new land when single-cropping wore out that land that they were upon. One hundred, two hundred years, of exploitation of the natural resources, moving to new frontiers, spreading like a cancer across this continent, taking the best, leaving or destroying at least as much as was used of crops, timber, wildlife, coal, oil, and minerals of the soil until, suddenly, the mad race was brought up short by the confused, blurred, shocking realization that there was no more. The cream was gone, and now a nation of still unbelieving people began to crawl back over the devastated places to lick up the skimmings thrown aside by earlier generations. This could not be true! But it was! Still, in 1950, more than half, yes more than seventy-five percent of the inhabitants of the United States go to market to buy food, to the fields to plant, to the factory to process food or make clothing, or to a thousand other daily tasks, and never once think of the precarious margin to which our land has dwindled. Some, reading of the floods, the dust storms, and the crop failures, feel a little sorry for the poor souls that have lost their homes and possessions. But it is so far away; it is just someone else whose property is gone, his farm ruined; it does not affect me. But it does affect you! That farmland was part of the heritage of our people. The farmers who tend it are rather like stewards into whose trusteeship we have left it. That land is the source of food for everyone of us, no matter how large the city in which we live!

The present tendency is a losing battle between soil productivity and the increasing population, with soil the loser. More and more acres of land are needed to feed each mouth as time goes on. If that tendency continues, when the time comes that there is only enough food to set one table the trustees — the farmers — will be sitting at that table! Certainly we cannot blame them, for all have been careless and negligent.

We are all indebted to the land. If we neglect its care, and fail to urge or help our trustees to care for it, we must all pay the penalty.

We are caught in a mad race to earn a quick dollar. Let those of the next generation worry for themselves. But those generations are our children! Has animal instinct overtaken human intelligence? Let us wake up and turn toward the human method of living! Let us use the increased knowledge that we have gained about better farming, and not spoil the heritage for our children! We have become soft through "abundant living;" we have forgotten how to get food — almost how to eat — because we are a generation fed with the silver spoon of indulgence and modern luxury. Some of these are not real. Let us get back to the soil!

The purpose of having strayed from the title of this article to describe a few conditions of the land is twofold. First, the facts cannot be emphasized too much, and each presentation may contain a little different angle that may attract one more believer. Second, I want to prove that mere reading of conditions is not sufficient to attract the learner strongly enough, nor to attract enough people to want to learn.

In much more eloquent style than this, a great deal has been written in books, and in nearly every kind of publication, for all to read. But eloquent phrasing, presentation of statistics, and the most powerful appeals make little, if any, real impression upon the average reader. We have become more and more dependent upon the power of pictures and drama to enlighten us and here we find them an important method of teaching.

Listening to lectures and reading books require closer concentration and more mental effort, if one is to get a fixed impression from their content. But if the impression can be strengthened by a visual image, a more lasting job of teaching can be done. We could say that there are several graded steps toward making a vivid impression. The most impressive mode of learning is by actually experiencing an act or process. Then, in order of decreasing vividness, come observation of an actual scene, "mock-ups," demonstrations, sound moving pictures, silent moving pictures, still pictures, photographs, diagrams, charts, listening, and reading. Notice how the action, or the burden of teaching, shifts gradually from the learner to the teacher as we progress toward the less vivid.

How can these steps be fitted into a pattern of meaningful experience for, say, a high school class whose teacher in civics, science, geography, agriculture, social science, or almost any subject, wishes to lead them into a unit on soil conservation? Obviously the ultimate purposes or aims for a social science class would differ from those of a class in agriculture; but back of both the chief concern is the development of proper attitudes and an awareness of the problem of soil sonservation. In both cases motivation is a prime requisite. Materials for the teaching of soil conservation are at hand or readily available. The U. S. Soil Conservation Service, State soil conservation extension services, a number of implement, fertilizer, and seed companies, and the county agricultural agent can supply pamphlets, photographs, films, and slides; also they often have a representative who is willing to discuss soil conservation before the class.

But the best source of material lies outside the window of most of our schools, and within easy driving distance of others. To use this material requires a more trained teacher, or, we should say, one who "has caught the vision." I am reminded of a story told me by a friend who, while on a tour of some rural schools to determine the extent of conservation instruction, visited one building which stood upon a badly-eroded, bare, clay bank. To his query, the teacher replied that they had no materials with which to teach soil conservation!

Have a bulletin board arrangement up in the room two or three days in advance of the unit. Show some pictures of "before and after" soil conservation practices; include sketches or photographs of contoured and terraced fields, strip cropping, etc. If the pupils are bulletin board conscious, they will soon note, and begin comment upon these pictures.

Curiosity is aroused. A trip out into the field where they can see different kinds

of soil, the layers in profile, some examples of erosion, silting, etc., should get students ready to investigate the formation of soil, what has happened to it through former farming practices, and what can be done to help restore it. Bring some samples back to the classroom. The pupils can do everything with those samples, from microscopic examination to building model plots to illustrate various soil conservation practices. One of the cleverest teaching devices I have seen was made by a high school boy who had brought in some woods loam and leaf mould, sod, and subsoil clay. He had filled shallow boxes with each kind of soil, elevated one end, and provided a means for water drainage at the lower end. A sprinkler, made from a can with holes in the bottom, allowed water to run over the soils at the same rate. The runoff was caught in pans and upon examination of the varying amounts of soil in each pan, one got the best argument for cover cropping, grassed waterways, strip cropping, contour tillage, terracing, and gully control that could be made — far more effective than a verbal or written argument would have been.

Other field trips to farms where contouring, terracing, etc. have been done will provide information and clinch impressions most securely; however, one of a number of movies will come near to the same objective. Also, the movie has the advantage of giving an over-all view of the operations and plan. Those of the class who have the opportunity actually to help build, or witness the building, of soil-saving devices will have a strong incentive to share the experience with the rest of the class.

Such films as *Harvest for Tomorrow* and *For Years To Come* (USDA) and *Conservation Road* (Films, Inc.) not only provide semi-technical information, but are excellent interest developers. *The River*, (USDA) a classical soil conservation film, emphasizes the socio-economic relationship of good soil and good living.

The soil is our heritage. It has taken but a small fraction as much time to tear it down to its present condition compared with ages required to build it by Nature's cyclic plant-animal growth and decay process. Now the trend is toward more acres needed to produce food for each human mouth. Slowly, however, the trustees of the soil are heeding the danger signs, and aided by foresighted city brothers, who would like to keep on eating, they are undertaking projects to rebuild and restore the good earth.

Michigan Conservation

Organization of a Division of Conservation at Michigan State College is announced by President John Hannah. Director of the new division will be Professor Paul A. Herbert, head of the Department of Forestry since 1930. There will be four departments — Conservation Institute, Fisheries and Wildlife, Forestry and Wood Utilization.

RABBITS, RABBITS AND RABBITS

(Continued from Page 316)

now and find his hole."

Walton remarked that the blackberry, introduced some 30 years or so ago by a settler who wanted blackberries, now has become as great a nuisance in his district as the rabbits themselves. Wouldn't you know that the blackberry brambles make excellent cover for the rabbits?

"Every blasted thing they bring in here flourishes," he said, citing the case of a flowering plant that was once thought admirably designed to lend a spot of beauty to the countryside. It now goes under the picturesque name of Patterson's Curse. Crows and foxes, introduced from abroad, thrive in the land, and the galvanized burr is enough to drive a farmer crazy if he is still sane after wrestling with the various other imported menaces.

But the rabbit is the No. 1 problem of the countryside, and some people account for this by saying that rabbits are getting smarter all the time. They can climb trees and fences better than formerly, it is said, and by some strange sense they can foretell a good season and so spare themselves the work of digging deep burrows.

"I don't hold with the notion that the bunny is gettin smarter," Walton said. He reflected a moment, and added, "After all, it's not his blasted brains that's put him where he is, is it?"

Fish and Wildlife Notes

Decrease of nearly one-fourth in the waterfowl populations was indicated by the annual inventory made by more than one thousand cooperative observers, according to Albert M. Day, Chief of the U. S. Fish and Wildlife Service. He said that there had been an illusion of increase because millions of birds remained in the United States during the mild fall instead of going on to Mexico. . . According to the Service, takes of fur animals are decreasing; populations of fur animals increasing; such furs as raccoon, opossum, skunk, fox and coyote a drug on the market. . . Wild nutria, a South American rodent about ten times heavier than a muskrat but similar to our native animal in color and general conformation, is rapidly increasing in Louisiana and adjoining States, following introduction in numbers in the 1930s. It is expected to become an important source of furs. It appears to get along with muskrats and waterfowl on the same marshes. . . The Service makes a strong plea for hawks and owls in a recent release, pointing out that they guard the farmers' profits like members of Nature's air force. A special plea is made for the snowy owl, shot in large numbers during its periodic visits, although it eats quantities of injurious rodents. Appreciation of the woodpeckers, bluejays and other bird allies is urged.

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PEEP IN THE PATIO

(Continued from page 296)

grasshopper, whose head and inner possessions I removed, so that there was left only an empty and headless husk. This I carefully stuffed with mashed leaf, wet with milk and water. My purpose was to see if life could be prolonged through the absorption of nutriment at scattered centers by a sort of osmosis. As a study in viability it was not a failure, for certainly the rough edges of death were smoothed away. Possibly what happened was not due to nutrition, but rather to the fact that the inner lining of the husk was not permitted to wither as fast as it might have, had there been no leafy protection against evaporation. Whatever the explanation, this leg-happy fellow continued to jump, when prodded, for sixty-three triumphant hours. His vigor dwindled so slowly that one wonders *when, if ever,* death took over and the ghoulish ghost expired.

Equally startling can be a sudden manifestation of life when its imminence is not suspected. Prying from the wall a delicately formed chunk of amberish something, about the size of a large olive, I brought it indoors as an example of the dependence of beauty upon symmetry. Some weeks later our house began to hop with minuscule objects, pale jade-green in color. Their source was traced to the amber, an unrecognized egg-capsule of a praying mantis. Dozens of little mantids were tumbling over themselves as they squirmed out of their prison. In the warmth of the house, they had hatched prematurely. All that we could catch we restored to the patio, but a frost disputed their right to be there, and few of them survived.

Afterward, an adult, (from who knows what mantid's capsule, for we now find them adhering to almost every tree,) flew into our dining room one evening when we were at dinner. It landed like a helicopter on a side table and cheerfully began, with scratchy sounds from its bewildered claws, to climb the steep sides of a pitcher. Once on top, it gazed around the room, turning its head this way and that, and fixed upon us a long friendly stare. Then in disgust it gave its eyes a thorough rubbing with its wrists, like a cat washing its face, and flew off to a screened porch. There it made itself at home for some weeks, depending on imported food. Three flies made an excellent meal, but flies were scarce and an occasional caterpillar had to be substituted. This it grabbed with its short arms, and gnawed from one end to the other.

One moonlit night, there jumped, not a cow over the moon, but a cat-sized animal over our wall. When I saw him scooting under the house through an aperture whose screen had been left open, I put out a hand to grab the fluffy tail. White stripes stopped me short. Should I then sit by the opening with a can of salmon, and if he came out, try to slide the screen behind him? An alarm clock was the answer. Perhaps by the wee small hours Mr. Polecat would have gone a-hunting. Most fortunately he had!

Let us draw a final curtain on this pageant of life and death in the patio. It is a late afternoon in summer. A sheet of rain is sweeping down from the mountain tops, flashes of lightning rip the clouds, and thunder smashes and rolls across the valley. Suddenly the storm vanishes, and in the peaceful crepuscule a new music arises on the soaking desert — an orchestra of "frogs." Their concert is so loud that we wonder how such small animals can produce it. Thousands of spade-foot toads, seen or heard only after a hard summer storm, have come up from underground to sing and rejoice and love.

JAVA'S ONE-HORNED RHINO

(Continued from page 298)

colossuses sometimes break or uproot entire trees when feeding.

The Javanese rhino is more nocturnal than diurnal in habits. During the day the animal seeks cover in the dense jungle vegetation, while at night it feeds and washes itself in some of the numerous mud-wallows present in the area. Bathing, however, takes place in the daytime, and is apparently a favorite pastime. While in the wallows, the animal rolls over and over. Sometimes it stays in such pools for hours at a stretch. After a bath, mud is rubbed off on the trees that surround a pool. Enormous dung heaps are produced, indicating the huge quantities of food digested. Only one young is born to a cow every four or five years after having been carried for about eighteen months. The calf is suckled for at least two years. As the reproductive rate is extremely slow, this means an extra danger to the survival of the species. It was one of the animals listed as requiring immediate protection by the International Conference on Nature Protection at Lake Success, New York, in 1949. It is to be hoped that conservationists throughout the world will aid the handful of enthusiasts in Indonesia in trying to save this vanishing species.

WILDLIFE IN THE MAILS

(Continued from page 320)

the world. Gradually the concept gained in popularity.

A cursory review shows that in the decade, 1891-1900, fifteen postage stamps were issued in which wildlife was used as the central theme of the design. In the following decade, 1901-1910, eighteen more appeared, and between 1911 and 1920, nineteen were issued throughout the world. At least 40 new wildlife stamps were released during the next decade and the peak was reached during the period, 1931-1940, when no less than 145 were issued. From 1941 to the present 69 more have been added and when it is realized that many of the stamps appearing in the previous decade are still in use, the concept of wildlife on postal issues throughout the world is a dominant one today.

THE HEAVENS IN JUNE AND JULY

(Continued from page 325)

telescopically to be in the gibbous phase. Mars is now decreasing noticeably in brightness. It is as bright as Vega on June 1, but by the end of July is not much brighter than Spica, which it passes on July 28. It remains in Virgo during these two months. It is on the meridian at sunset the end of June and sets about midnight. It is low in the west by the end of July at sunset, setting between two and three hours after the sun. Jupiter is in the constellation of Aquarius. It rises about midnight in the southeast the middle of June, and in the late evening in July, and is visible for the remainder of the night. Saturn remains visible in the western evening sky in the constellation of Leo. On June 3 it is due south at sunset. The middle of June it is about midway between Regulus and Mars. By the end of July it is low in the west at sunset. At that time it is exactly equal to Regulus in brightness and not much inferior to Mars which is now rapidly decreasing in brightness. It will be interesting to compare the change in brightness of these two planets with that of Spica and Regulus which remain unchanged.

Summer will commence in the northern hemisphere and winter in the southern hemisphere when the sun is farthest north of the equator on June 21 at 6:37 P.M., Eastern Standard Time.

"David's Folly"

We were intrigued by a folder that comes to hand from "David's Folly" Earthworm Farm, West Brooksville, Maine, principally at the choice of the name. The folder does not reveal who David was or what kind of folly he indulged in. It does, however, tell the story of the value of earthworms, where to put them and how to enlist their cooperation. If you are short on earthworms and would like to remedy that situation drop them a line and ask for a folder.

Demonstration Forest

Research and practical demonstration of woodland management will be carried on by Iowa State College on a 296-acre forest near Delhi, Iowa. This tract came to the College under the will of the late Emma L. Brayton, who had indicated much concern over the destruction of native Iowa timber. The forest will stand as a memorial to Miss Brayton's father and mother.

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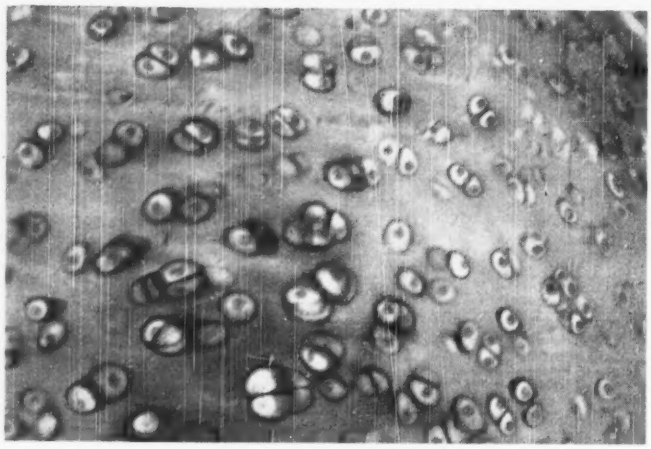
Under the Microscope *By* JULIAN D. CORRINGTON

CARTILAGE



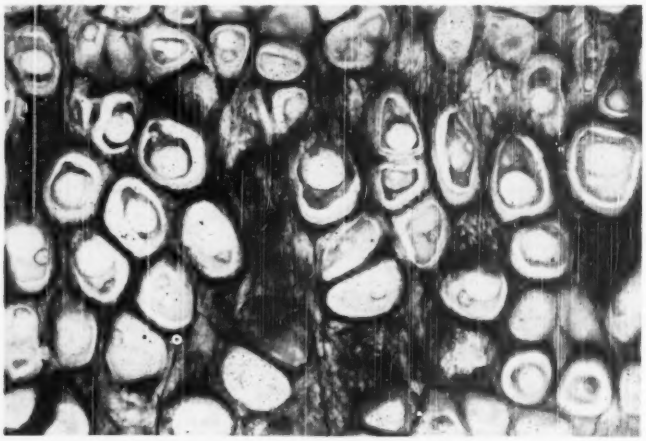
Hyaline Cartilage 400X

FOLLOWING a discussion of bone (May issue) it is entirely fitting to broach the other form of dense, solid connective tissue — cartilage or gristle. Everyone knows a bone when they see one, but to a great many people the word *cartilage* is, at best, technical; at worst, mysterious. Yet, with certain exceptions, the bones of our skeletons begin their careers as cartilages: in the fetal stage our vertebrae, ribs, sternum, and bones of arms and legs are represented by rods, bars, and pieces of cartilage, more or less in the shape, position and relative size of the bones that will replace them. Here and there these cartilages do not ossify but remain as such in the adult. Thus, in man, the articular surfaces where two bones meet at a joint, as in the shoulder or elbow; the lower ends of the ribs, where they join the sternum; the tip of the nose, external ear, larynx or voicebox, are all examples of various forms of cartilage.

As usual, the Greeks had a name for it, and that name was *chondros*. This gives us a convenient combining form — chondro — to use in making up words having to do with this substance. Where a cartilage will appear later, the mesenchyme, or embryonic connective tissue, forms dense nodules called *centers of chondrification* (cartilage — to make). The mesenchyme cells divide and grow rapidly, withdrawing or else sooner or later losing their syncytial processes that connect one cell with its neighbors, resulting in a mass of *precartilage*. These cells may now also be termed chondroblasts (cartilage-formers) for, by secretion of matrix, each now becomes a cartilage cell or *chondrocyte*. Opinions have not always been in agreement as to the role played by the cells themselves in forming matrix, in this or in other cases involving connective tissues. However, since new matrix appears between two daughter cells, following a mitosis within cartilage matrix — hence not in contact with surrounding membranes, blood vessels, or other outside influences — it seems that the cartilage cell itself must produce a secretion which it then gives off, and that this secretion either becomes matrix, or acts on surrounding fluids, when present, to produce matrix.

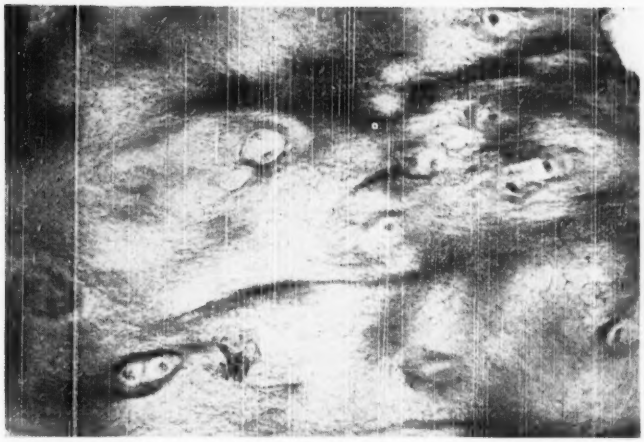
When first formed, the matrix stains a light pink with a hematoxylin (blue) and eosin (red) staining combination, showing its acidophilous or acid-loving nature, but soon, with increasing density, it becomes basophilic and takes the blue of hematoxylin. In the immediate vicinity of the cartilage cell, the matrix is often denser than elsewhere and takes a deep blue stain, the more remote matrix being much lighter. Such dense shells of matrix around cells are designated as *capsules*.

The immured cartilage cells do not cease all activity. For a time, in young cartilages, they may display mitotic activity. Our illustrations show the cells occurring in nests or groups as a result of divisions. Having separated, new matrix may next appear between the daughter cells, pushing them apart; frequently one divides again, making a nest of three, or both divide, producing a quartet. Sometimes the direction of division is such as to form longitudinal rows. The new cells are generally crescentic or wedge-shaped for a while. This procedure results in a limited amount of *interstitial or endogenous growth* — growth within. This takes place in spite of the solid nature of cartilage and is a unique propensity, not possible in bone. Cartilage likewise grows at the surface, as does bone, by *appositional or exogenous growth*.



Elastic Cartilage 400X.

Surrounding every cartilage is a sheath, the *perichondrium* (around-cartilage) which blends outwardly with ordinary connective tissues. This dense membrane is fibrous and richly supplied with blood and lymphatic vessels and with nerves, none of which, with certain exceptions, penetrate the cartilage itself. Thus this tissue enjoys the further unique distinction of being without vessels (avascular) or nerves. Yet the buried cells remain living, and so it is evident that food materials and oxygen can seep slowly through the matrix from perichondrial sources. Fat and glycogen accumulate in the cartilage cells, the fat in relatively large droplets. After alcoholic dehydration, in preparing a slide of cartilage, this stored fat is dissolved out, leaving empty vacuoles, so that the cytoplasm and even the nucleus of the adult cartilage cell, thus prepared,



Fibrocartilage, 100X.

commonly appear full of holes.

Appositional growth from the perichondrium is much the more active of the two methods, cartilages growing mostly by additions from without, like a snowball. Fibroblasts or primitive connective tissue cells in the perichondrium secrete matrix, which incorporates both these cells and their surrounding fibers as it solidifies. The cells lose their processes, round up, and enlarge; the fibers blend with the matrix to such an extent that they are no longer separately visible. All forms of cartilage are fundamentally fibrous, the matrix containing white or collagenous fibers. The refractive index of the fibers is so nearly like that of the matrix secretion that the two blend perfectly and are indistinguishable save by special techniques or polarized light.

The space in the matrix occupied by a cartilage cell is the *lacuna* (lake). In life the lacuna is more potential than evident, the cell completely filling all space within its capsule; but in fixed and stained preparations the cells have shrunk away from their enclosing walls and the lacunae are visible.

Certain exceptions must be made to the statement that blood vessels do not enter cartilages. During ossification of the fetal cartilages, after the shaft or diaphysis of any of the long bones is well under way, the knobs or epiphyses at the ends are so large that apparently some of the interior cells are too far removed from a perichondrial surface to receive adequate nourishment, so channels invade the matrix from the perichondrium, carrying fibrous connective tissue which brings in blood vessels. This is true, too, of the cartilage forerunners of certain of the larger square bones, as the astragalus of the ankle. These embryonic conditions are transient, however, so that the statement that cartilage is avascular holds for all adult cartilages.

The most widespread type of this tissue is *hyaline cartilage*, the adjective meaning glassy, and referring to the clear, homogeneous, and translucent appearance of the matrix. Fresh sections look watery. Actually, as we have seen, this matrix is permeated with fibers, as in other types, but these are not visible. Hyaline cartilage may be studied in sections of any part of the endoskeleton of embryos, as the fetal pig, and, in adult vertebrates, preparations of tracheal or bronchial rings, most of the laryngeal cartilages, those making up the flexible part of the nose, the xiphoid process of the sternum, the ribs (costal cartilages), and the articular cartilages of the joints. The matrix stains characteristically with hematoxylin.

Elastic cartilage is found in the pinna (auricle) or external ear flap, the tube leading in to the eardrum (external auditory meatus), that which connects the mouth cavity with the middle ear (Eustachian tube), epiglottis, and certain of the smaller cartilages of the larynx. It is characterized by the inclusion of a good many elastic fibers in the matrix, in addition to the invisible collagenous ones. So much elastic tissue is present that these cartilages have a yellowish appearance in the fresh condition. The favorite technique to display the features of this cartilage is Weigert's elastic stain, which is resorcin-fuchsin, the elastic fibers being colored deep purple. The external ear of any available mammal is the customary material.

The third variety is *fibrocartilage*, also called fibrous cartilage or white-fibrocartilage. Here the matrix is filled with large, visible bundles of white fibers. The more accurate way to put it is to say that a dense fibrous connective tissue, as tendon, has a limited amount of hyaline matrix deposited in certain areas, the cells then rounding up and lying within lacunae, thus differing markedly in appearance from the flat tendon cells. Favorite places from which to obtain specimens for sectioning are the symphysis pubis and the intervertebral discs, but this type also occurs in many of the articular cartilages, such as those at either end of the clavicle

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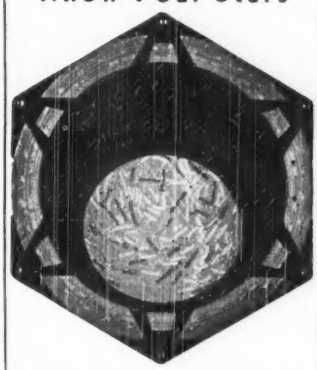

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or for the mandible, at the juncture of tendon and bone, and lining certain channels or grooves in bone through which tendons work back and forth. This cartilage is well stained with hematoxylin (matrix blue) and eosin (fibers red).

The statement is usually made that, inasmuch as cartilage precedes bone in the development of the embryos of all vertebrates above sharks, that it is the older of the two skeletal materials. Also, lampreys and sharks, the lowest vertebrates, have endoskeletons made wholly of cartilage, bone not appearing until the true or bony fishes come upon the scene. However, the evidence from paleontology proves that the exoskeleton is much older than the endoskeleton: the oldest of known vertebrates are the Ostracoderms, armored fish-like types long extinct, that had a complete covering of bony plates. The exoskeleton never contains cartilage, but only bone and horn, the latter an epidermal contribution. This form of bone, called membrane or dermal bone, is laid down directly in connective tissue, without going through a cartilage stage, and its original purpose was that seen today in a gar (fish) or turtle — as a suit of armor. Lampreys have wholly lost this covering and have not progressed so far as to acquire a bony endoskeleton, hence are without bone in any form. Even their cartilages are few and scanty, for that matter, especially so in the related hagfishes, which have virtually no skeleton at all in the usual descriptive sense, and find themselves in the equivocal position of being vertebrates without vertebrae!

Sharks and their relatives retain the bony armor in the form of numberless microscopic placoid scales, each having a basal plate composed of bone. Here too there is as yet no bony endoskeleton; the selachian internal supporting skeleton is entirely of cartilage, and is large and extensive.

Even the earliest members of the group of true fishes, or Pisces, the sturgeons, follow the shark pattern in many features, including the skeleton. Above this level however, two kinds of bone are present, dermal bone of the exoskeleton, and cartilage bone of the endoskeleton, the invention of the latter spelling the doom of cartilage as a major supporting structure of vertebrates and preparing the way for an invasion of the land environment, where bone is a more suitable framework. How cartilage comes to be replaced by bone during embryonic development, and how the older exoskeleton and the younger endoskeleton become inextricably intermingled in certain places, as the skull, are chapters in this sequence that remain to be told.

CALLIOPE'S CORNER

At the present writing we are having a rash of poetry. If this trend continues we shall have to abandon our title, "Under the Microscope," in favor of the above.

Out of Honolulu comes word from Dr. de Laubenfels, who sent us *Fairyland Discovered*, and which we ran in the February issue, that one of his colleagues read the poem and was moved likewise to commit versification as a fitting form of rejoinder. Professor Robert W. Clopton is chairman of the Department of Education, University of Hawaii, and, although our correspondent says naught of this poet's biological training, it is quite apparent from the subjoined that he knows his micros!

I KNOW WHAT YOU MEAN

By Robert W. Clopton

I've been in your Fairyland
  Where, taking children by the hand,
I've introduced them to the view
  Of things not seen in any zoo.
I've seen the wonder in their eyes
  As they have gazed with charmed surprise
At dragons, as they twist and bungle
  Through the matted algal jungle;
At paramecia, always dashing;
  Vorticelli, madly lashing
Out at hapless infusoria
  Amidst the hyphal sporophoria.

And in the land of microscope
  I've helped the children, (so I hope)
To know their world, and come to see
  That tiny plants and creatures wee
Live with them in the selfsame stream
  Of life; that air and water teem
With other creatures than they've known
  By their unaided eyes alone.

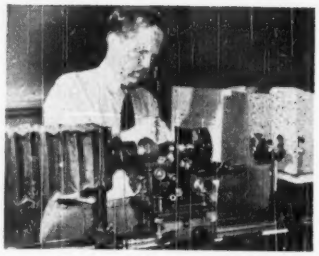
I've shown them new and clearer views
  Of things within their wont and use —
Germs sprayed out with careless sneezes,
  Molds that flavor costly cheeses,
Crawling "uku", dormant nit.
  These sights, and others, bit by bit
Have led them onward toward the goal
  Of more intelligent control
Of nature's forces, which impinge
  On them, and on which hinge
Their happiness and all well-being.
  Knowledge often comes from seeing!

Creatures charming, creatures hateful,
  For the chance to see, we're grateful.
Every time we take a look
  We thank Anton van Leeuwenhoek.

NEW MICROSCOPE AIDS CANCER RESEARCH

A new type of ultra-violet microscope, designed primarily for use in cancer research, has been developed during the past two years by the Bausch & Lomb Optical Company, of Rochester, N. Y., and the Polaroid Corporation, Cambridge, Mass. Focusing is done in visible light and photographs taken with ultra-violet without disturbing the setup. A band of wavelengths is employed rather than monochromatic illumination, and hence the intensity is high and the exposure time brief. The revolutionary objectives are of the reflecting type and are consequently corrected chromatically throughout the entire ultra-violet and visible spectrum.

According to Leon V. Foster, of B & L, co-designer of the new instrument, "All of the elements, mirrors, and lenses have simple spherical surfaces, extremely precise but relatively easy to produce by advanced grinding and polishing methods." Our illustration shows the other B & L co-designer, John V. Butterfield, working with the instrument, and will carry more than passing interest for readers of *Nature Magazine*, since it is Mr. Butterfield, one of the leaders in his profession, who makes the illustrations each month for this Department.



John V. Butterfield, co-designer of the new Bausch and Lomb Ultra-Violet Microscope, prepares to make a photomicrograph of a living tissue culture.

Now in use at the Sloan Kettering Institute for Cancer Research and at the Massachusetts Institute of Technology, the microscope is particularly valuable for direct photographic recording of tissues, for determining biochemicals through photoelectric means, and for studies in measuring densities of exposed and developed film, notably in photographic sound recording.

Three different ultra-violet wavelengths are employed, greatly increasing the microscope's resolving power, and enabling direct or photographic viewing of sections or cultures of living cells and tissues. The photographs may also be projected or reproduced on color film through three visual color filters that provide densities, contrast, and structural detail never before attained, according to reports we have received. By measuring the ultra-violet transmission of individual cell parts at different wavelengths of light, subtle changes in chemical balance within the living cell may be determined. An example of such a change might be cancer formation, or something linked with carcinogenesis.

B & L CENTRAL DIVISION

Announcement has been made of acquisition of the Riggs Optical Company of Chicago by Bausch & Lomb. The midwestern firm will henceforth be known as the Bausch & Lomb Optical Company, Central Division, with headquarters at 18 South Michigan Avenue.

The Division will have four District offices — at Chicago, Minneapolis, Kansas City and Dallas, and will comprise 57 branch offices. This move follows a merger to produce a Northeastern Division last December, and another to form a Pacific Division in October, 1948.

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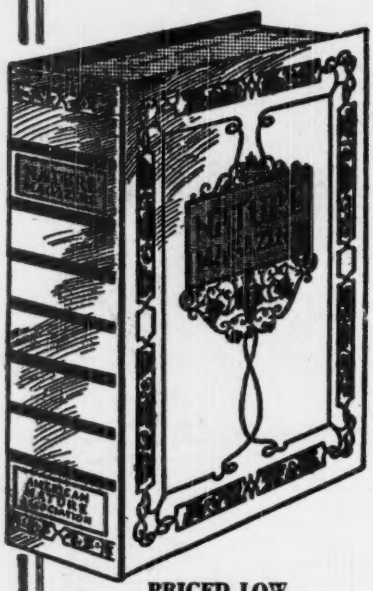

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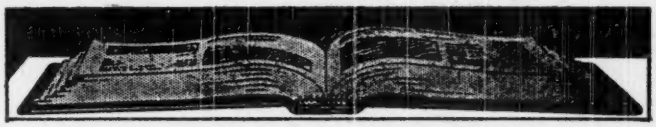

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